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SODIUM METABOLISM IN HEALTH AND DISEASE AND A PHOTELOMETRIC METHOD FOR ITS DETERMINATION IN BIOLOGICAL FLUIDS*

SISTER MARY SIMEONETTE SAVAGE, M.S., M.T. (ASCP)
Medical Technology Department, Nazareth College, Louisville, Kentucky
AND
SISTER JOHN EMILY MAGINNIS, B.S., M.T. (ASCP)
Clinical Laboratory, St. Joseph Hospital, Lexington, Kentucky

Introduction

Inorganic compounds exercise a great diversity of vital functions in the economy of the body. Because of their influence on such phenomena as permeability of cell membranes, hydrogen ion and osmotic equilibria, and the solubility of proteins, the mineral salts dissolved in the body fluids affect all body functions.[1]

Sodium is one of the mineral elements essential for life. In the blood of man, sodium predominates in the plasma and it is the chief base in lymph, edema fluid, cerebrospinal and other extracellular fluids. Since sodium forms the backbone of the electrolytic structure of the body fluids, it is the major determinant of the osmotic value of the plasma. Because of its influence upon plasma volume, sodium exerts an important effect upon cardiovascular efficiency.[10]

Development of Our Knowledge of Sodium Metabolism

Radioactive Isotopes in Medical Research

During recent years, the science of nuclear physics not only has given the world the atomic bomb, but has also made available to medical research the isotopic tracer, one of the greatest scientific tools since the invention of the microscope.

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The use of isotopic tracers for medical research is based upon the fact that isotopes are physiologically indistinguishable to the living cell. In metabolic studies, the substance to be investigated is synthesized, so that one or more of its component atoms are replaced by corresponding isotopic atoms. In this way, the physiological test substance is "tagged," and its subsequent distribution in the various body tissues can be followed.[22]

The use of radiosodium as an investigative tool, has resulted in the development of new concepts of sodium metabolism.[14]

Rates of Sodium Turnover

It has been found[5] that sodium diffuses through the vascular wall in man with at least two rates. The sodium that diffuses at the more rapid rate is mainly concerned with an exchange between the plasma and the interstitial fluid, while that which diffuses at the slower rate is probably concerned with exchange between the plasma and such fluids as the vitreous body, aqueous humor and cerebrospinal fluid.[17]

In a normal subject, the average rate of diffusion indicates that about thirty-two per cent of the total plasma sodium diffuses out of the blood every minute. This approaches a diffusion across the vascular wall equal to about eighteen pounds per day.

Patients with congestive heart failure under treatment, including dietary restriction of sodium, show a more rapid rate of sodium diffusion from the vascular bed than do normal subjects.[20]

Serum Electrolyte Studies

Much has been learned concerning water turnover and its relation to sodium and to the total electrolyte distribution.[5,6] Total body fluids are separated into two main divisions, the extracellular fluid and the intracellular fluid. This division is the result of the differential restraint of electrolytes at the cell boundary. Intracellular fluid contains potassium as the predominant cation and phosphate and protein as the main anions, while the chief ions of extracellular fluid are sodium, chloride, and bicarbonate.

The function of these fluid compartments differs as well as their electrolyte composition. Cell fluid is the medium in which the processes of cell metabolism takes place. Extracellular fluid serves both as a buffer to preserve a constant environment to the cells and as a path of exchange for many substances between the cells and the environment.

Fluid Exchange Between Cells and Extra-cellular Fluid

It has been demonstrated that when radioactive sodium is injected intravenously, it is distributed through a limited volume.[18]

This limitation of the distribution of the sodium ions suggests that they are, in the main, excluded from the cells. Research shows, however, that although sodium is chiefly restricted to the extracellular phase, in certain tissues portions of these ions are intracellular. This is true for sodium in cardiac and skeletal muscle. The intracellular fractions are significant because alterations in their concentrations do occur in certain pathological conditions.[11,12]

External Exchanges of Body Fluids

The exchanges which occur between the body fluids and the alimentary canal are primarily concerned with the addition to the body of water and various organic and inorganic solutes. The sensation of thirst, which is related to the concentration of solutes and the rate of hydration of the tissues, controls the ingestion of water. Large volumes of fluid are continuously being secreted into the gastro-intestinal tract and reabsorbed into the body fluids. These fluids are modified portions of the extracellular fluid, as is indicated by the predominance of sodium as the cation and chloride and bicarbonate as the anions. In the gastric juice, sodium is replaced by the hydrogen ion. Elsewhere in the tract, sodium is the chief cation. The secretion of large volumes of salt-containing fluids into the gastro-intestinal tract, renders the organism especially susceptible to severe salt and water depletion in any abnormal condition which interferes with the normal absorption of these fluids.

As the kidney is the only organ that can separate water and so elaborate a fluid hypertonic or hypotonic to the rest of the body fluids, their major regulation devolves upon it. In this capacity the kidney is an organ of conservation as well as of excretion, for upon its fluid exchanges rests the maintenance of a constant internal environment, the prerequisite for life. Body water and its ionic solutes are kept within various limits in optimum absolute amounts and in optimum proportion to each other. The kidney performs these functions by the mechanisms of glomerular filtration, tubular reabsorption, and tubular secretion.

Under certain circumstances, the reabsorption of electrolytes, principally sodium and chloride, may exceed that of water. Moderate excesses of water in the body results in a diuresis of essentially chloride-free urine, the lowered serum chloride concentration being associated with an increased reabsorption of chloride in the renal tubule. Large excesses of water, however, lead to such an increase in the rate of glomerular filtration that not all of the sodium and the chloride in the filtrate is reabsorbed. Under these conditions salt depletion of the body may ensue.

In depletion of water and salt, the urinary excretion of water

is greatly diminished and that of sodium and chloride may cease entirely. Reduction of the volume and the ionic concentration of the extracellular fluid results in a greatly increased tubular reabsorption of water and of sodium chloride. Diminished plasma volume and peripheral circulation collapse are commonly present in this condition and lead to a reduction of glomerular filtration as well.

When depletion of water in excess of salt occurs, the concentrations of sodium and chloride is increased and the elevations of the serum concentration are maintained. This retention of salt results in an osmotic shift of water from body cells and thus mitigates the fall in extracellular fluid volume. A similar reaction occurs when salt is given in excess of water. A diuresis is produced which leads to dehydration, but the reabsorption of sodium and chloride is increased so that the serum concentrations remain elevated.

The hormone of the adrenal cortex has a direct effect on the tubular reabsorption of sodium and potassium. In adrenal cortical insufficiency, decreased tubular reabsorption of sodium leads to a severe sodium deficiency. Secondary to the loss of sodium, a diuresis occurs which leads to depletion of water as well. But as sodium is usually lost in excess of water, the concentration of sodium in the extracellular fluid is lowered. This results in an osmotic shift of water into cells. Such subjects are peculiarly susceptible to water intoxication.[10]

Cantarow and Trumper state that a number of steroid hormones probably exert an effect upon sodium and water balance. Of the adrenal cortical hormones, desoxycorticosterone causes marked retention of sodium and corticosterone moderate retention (decreased renal excretion); an opposite effect is produced by 17-hydroxycorticosterone and 11-dehydro-17-hydroxycorticosterone (increased renal excretion). Several of the sex hormones cause retention of sodium and water, including estradiol, progesterone, estrone, pregandiol, and testosterone. The sodium retaining effect of the estrogens may have some bearing upon the condition known as premenstrual tension.[8]

Pathological Physiology of Sodium

Diminished Plasma Volume

Complete withdrawal of water from the mammalian organism results in depletion of water in excess of salt because of the continued insensible loss of water for the dissipation of heat. This water loss is distributed over both phases of body fluids and the total concentration of base is elevated, as is evidenced by the rise in serum sodium concentration.

Sweating in the subject deprived of water, accelerates the rise in total ionic concentration of the body fluids and accentuates

the diminution of extracellular fluid volume. This is because sweat is a hypotonic solution of sodium chloride, and its excessive secretion produces both a loss of extracellular base and a loss of water. As a result, circulatory collapse is more rapidly induced than in simple water deprivation.[10]

Depletion of Salt in Excess of Water

In adrenal cortical insufficiency, a marked reduction in total base occurs, which is due entirely to the loss of sodium. The potassium level of the serum is raised above the normal level, the rise being due to reduced excretion by the kidney as well as to leakage from the tissue cells into the extracellular fluids. The loss of sodium is accompanied by an increased elimination of water, producing marked dehydration.[4]

Prolonged gastro-intestinal fluid loss with replacement of water alone, is probably the most common clinical example of a depletion of salt in excess of water. The loss of such fluids by vomiting, diarrhea, fistula, or intubation is a removal from the body of isotonic extracellular fluid. These patients are frequently given salt-free fluids and as dehydration and salt depletion progress, the total ionic concentration falls. The kidney attempts to preserve volume at the expense of concentration by not excreting all of the salt-free fluid ingested.

Retention of Water in Excess of Salt

Water intoxication is found clinically, where large amounts of water have been taken by sodium-depleted subjects, usually as a result of excessive sweating. The extreme manifestations are muscle cramps and convulsions, due to a marked drop in the ionic concentration of the body fluids.[10]

Retention of Salt in Proportion to Water

Edema is the clinical name for the accumulation of excess extracellular fluid at isotonic concentration. Such extra fluid may be evenly distributed throughout all the tissues. More commonly, however, it is pooled in certain tissues. The extra sodium and water present in such interstitial pools cannot be excreted by the kidney because of their inaccessibility to the circulating plasma. Edema is most commonly found in those conditions in which the hydrostatic pressure in the capillary is elevated, as in congestive heart failure and mechanical obstruction to the venous return and in those conditions in which the colloid osmotic pressure is lowered because of a low concentration of serum albumin, as in cirrhosis of the liver, malnutrition, and the nephrotic stage of chronic glomerulonephritis. In the terminal stages of chronic glomerulonephritis, sodium is wasted by the kidney with the result that the body fluids become hypotonic,

extracellular volume is diminished, and a metabolic acidosis ensues.[10]

The Determination of Sodium

Evaluation of Various Methods

In view of the increasing significance of the acid-base and the osmotic equilibria of body fluids and of the importance being attached to the role of sodium in body economy, the accurate determination of sodium in body fluids has become a necessity. The status of the estimation of sodium has changed from that of a procedure rarely performed in the clinical laboratory to one that is included in the daily work of the average laboratory technologist.

Barber and Kolthoff in 1928 were the first to employ the triple salt, uranyl zinc sodium acetate for the quantitative dedetermination of sodium by a gravimetric procedure.[3]

Butler and Tuthill modified this gravimetric procedure for the determination of sodium in biological material.[7] These gravimetric procedures are tedious and require relatively large amounts of material for analysis.

Weinbach developed a titration method based on the precipitation of sodium in alcoholic medium as the triple salt, uranyl zinc sodium acetate. The precipitate, which is soluble in water, is titrated with sodium hydroxide, the reaction depending on the formation of the amphoteric hydroxides of uranium and zinc.[21] This method has its limitations, because the subjective error of determining the end-point, which is often indefinite and difficult to read, is usually over one per cent. The estimation of sodium in serum requires greater accuracy than do most blood analyses, for the range of the normal concentration of serum sodium is very narrow.[16] Any method, therefore, for serum sodium analysis, to be of any value must have an error not greater than one per cent.

Hoffman and Osgood's photelometric modification of Butler and Tuthill's method[16] is an accurate procedure for the determination of sodium in serum and urine. The test depends upon the photoelectric measurement of the uranyl zinc sodium acetate in water to which NH_4SCN is added to stabilize the color against temperature change. Since the NH_4SCN solution used, is relatively unstable, it must be titrated at frequent intervals against a standard $AgNO_3$ solution. The necessity of frequently checking the NH_4SCN solution makes this procedure a time-consuming process for the average clinical laboratory.

The speed and accuracy of the flame photometer for measuring sodium are largely offset by the fact that the problem of flame stability has not been solved. The reproducible accuracy, therefore, is only five to ten per cent, even in expert hands. The

spectrophotometric method of Goldzieher and Stone has a reproducible accuracy of only 3 per cent.[13] These methods, therefore, do not meet the standard required for accurate sodium determinations in biological fluids.

In the opinion of the writers, the method of choice for sodium estimation is the photelometric technique of Darnell. It is a simple, accurate method for the determination of sodium in biological fluids.[9]

Darnell's Photoelectric Method for Determining Sodium in Biological Fluids

Principle

Darnell's photoelectric method consists of a precipitation of uranyl zinc sodium acetate from alcoholic solution, the removal of the excess precipitant by washing with ethyl acetate in acetic acid and with ether, the removal of the phosphates as uranyl phosphate, and the photelometric measurement of the color developed by sulfosalicylic acid and sodium acetate. The accuracy of the method has been demonstrated by the agreement between duplicate samples treated in the same way. As an absolute check on the accuracy, known amounts of NaCl, both in simple aqueous solution and added to blood sera have been measured. The results show that the maximum error is less than one per cent, the norm required for sodium determinations.[16]

Reagents

1. Trichloracetic acid, twenty per cent solution.
2. Ashless filter paper, Whatman No. 40.
3. Uranyl Zinc Acetate Reagent, prepared according to Weinbach:[20]

   Sol. A: 77 gms. of uranyl acetate, $UO_2(C_2H_3O_2)_2 \cdot 2\,H_2O$ and 14 ml. of glacial acetic acid are dissolved by heating and stirring in 400 ml. of water. he solution is made up to 500 ml. in a volumetric flask.

   Sol. B: 231 gms. of zinc acetate, $zn(C_2H_3O_2)_2 \cdot 2\,H_2O$ and 7 ml. of glacial acetic acid are dissolved by heating and stirring in 400 ml. of water. The solution is made up to 500 ml. The two solutions are mixed while still warm. After standing twenty-four hours, the solution is ready for use. It is filtered immediately before using.
4. Ethyl alcohol, 95 per cent.
5. Ethyl acetate-acetic wash reagent: 300 ml. of C.P. ethyl acetate are diluted to one liter with glacial acetic acid.
6. Ethyl ether, redistilled.
7. Sulfosalicylic acid, five per cent solution, checked by titration against standard sodium hydroxide. 5 ml. of sulfosalicylic acid require 17.25 ml. of 0.100 N sodium hydroxide for neutralization to a phenolphtalein end-point. Variations in the

relative amounts of sulfosalicylic acid and sodium acetate used in the development of the color, were found to cause variations in the intensity of the color. Consequently, a standardized solution must be used. A five per cent solution of sulfosalicylic acid is too strong, and the solution is adjusted as follows:

$$\frac{T}{17.25} \times \frac{V}{1} = T.V.$$

T.V. = Total number of ml. to which the volume of sulfosalicylic acid must be diluted.
T.V. minus V = ml. of water to be added to V.
T = ml. of 0.1 NaOH solution used in the titration.
V = volume of sulfo salicylic acid (volume remaining after titration) which must be adjusted.

8. Sodium acetate trihydrate, 10 per cent solution: 50 grams of C.P. sodium acetate are dissolved in water and diluted to 500 ml.
9. Sulfuric acid, 6 N.
10. Hydrogen peroxide, 30 per cent.
11. Nitric acid, concentrated.

Technique

For the determination of sodium in blood, urine, cerebrospinal or ascitic fluids, 1 ml. of a 1:10 trichloroacetic acid filtrate of the material or 0.1 ml. of the material wet-ashed by the procedure of Hoffman and Osgood[16] is analyzed:

1. In the preparation of trichloroacetic acid filtrates 1 ml. of biological material is delivered from a pipette (calibrated to deliver) into 7 ml. of distilled water in a test tube. While shaking the tube gently, 2 ml. of 20 per cent trichloroacetic acid are added. The contents of the tube are thoroughly mixed by stirring and allowed to stand for ten minutes. After filtration through an ashless filter paper, 1 ml. of the clear filtrate is delivered from a pipette (calibrated to deliver) into a 15 ml. conical centrifuge tube.

   In the preparation of ashed samples, 0.1 ml. of the material to be analyzed is delivered from a pipette (calibrated to deliver) into a 15 ml. conical centrifuge tube of heat resistant glass. After the addition of 0.2 ml. of 6N H_2SO_4 and 0.1 ml. of concentrated HNO_3, the tube is placed in a beaker of boiling water for ten minutes or longer. The tube is then removed from the water bath and the contents are charred over a free flame. By allowing a small flame from a microburner to strike just above the level of the liquid in the constantly shaken tube, very little danger of loss from spattering is encountered. The tube is allowed to cool. Then one drop of 30 per cent hydrogen peroxide is added from a

capillary pipette. The contents are again evaporated over a free flame until sulfur trioxide fumes fill the tube and then the tube is allowed to cool. The addition of hydrogen peroxide is continued until, after the evaporation to sulfur trioxide fumes, only a colorless drop of liquid remains in the tube. (6 drops or fewer of hydrogen peroxide will usually be sufficient to produce a clear solution.) After the final evaporation with hydrogen peroxide, the tube is allowed to cool for ten minutes or longer. To it is added 0.9 ml. of distilled water. After mixing, the material is ready for treatment with uranyl zinc acetate reagent.

2. To 1 ml. of the trichloroacetic acid filtrate or to the solution prepared by wet-ashing,[16] is added 5 ml. of freshly filtered uranyl zinc acetate.
3. At five minute intervals, seven 0.3 cc portions of ethyl alcohol are added. These additions should take at least thirty minutes and may take longer. After each of the first five additions of alcohol, the liquid in the tube is mixed, first by tapping the bottom of the tube, producing a rotary motion in the upper part of the liquid, then by rolling the tube between the palms, thus mixing the contents in the lower part of the tube. The last two additions of alcohol serve to wash down the walls of the tube and are allowed to remain layered on the solution. (Do not mix.)
4. After the last addition of alcohol, the mixture is centrifuged 2000 r.p.m. for ten minutes.
5. The supernatant fluid is decanted, and the tube is inverted and drained for five minutes.
6. The mouth of the tube is wiped dry. The precipitate is agitated by blowing on it a fine stream of about 2 ml. of ethyl acetate-acetic acid wash liquid. The wall of the tube is washed down with a small amount of the liquid. (In the case of a urine determination because of the large amount of phosphate present, the precipitate must be agitated by stirring with a glass rod, which must be washed off with the wash reagent after each use.)
7. The tube is centrifuged for ten minutes, drained for five minutes, and the mouth of the tube is wiped as before.
8. The precipitate and the walls of the tube are washed with about 5 ml. of ether. (Precipitates from urines must be stirred with a glass rod as indicated above.)
9. The tube is centrifuged for about five minutes; the supernatant fluid is decanted, and the tube is drained for one minute only. (Longer draining may allow the flaky precipitate to become too dry and to fall out of the tube.)
10. The precipitate is washed a second time with 5 ml. of ether.

The tube is centrifuged for five minutes, and the supernatant fluid is decanted. The tube is drained for one minute.

11. The tube is placed in the incubator (37° C) for five minutes to evaporate the last traces of ether. (To this point the technique is the same for all biological fluids, with the exception of the agitation of the urine precipitates as noted.)

For blood, ascitic and cerebrospinal fluids:

12. The washed and dried precipitate is dissolved in 4 ml. of water. It is transferred quantitatively to a 100 ml. volumetric flask, and diluted to about 70 ml. with distilled water. This Flask is labeled No. 1.
13. 4 cc of the standardized 5 per cent sulfosalicylic acid is added to Flask No. 1. 4 ml. of the 5 per cent sulfosalicylic acid is placed in another flask. This Flask is labeled No. 2.
14. To both flasks, 4 ml. of 10 per cent sodium acetate trihydrate is added. The contents of both flasks are diluted to the 100 ml. mark with distilled water and mixed well.
15. The Cenco Photelometer is set to read 100 with the contents of the solution in Flask No. 2, using the blue filter. The sample (contents of Flask No. 1) is read, using the blue filter. The concentration of sodium in the sample is read from a curve previously obtained with known standards.

For urine:

12. The triple salt precipitated from urine is dissolved by shaking it with 10 ml. of distilled water. Any uranyl phosphate present, remains in the form of a gelatinous precipitate. The tube is centrifuged for ten minutes at 2000 r.p.m.
13. 5 ml. of the clear supernatant fluid is pipetted into a 50 ml. volumetric flask.
14. It is diluted to 35 ml. with distilled water.
15. 2 ml. of the standardized sulfosalicylic acid are added and mixed well.
16. 2 ml. of the 10 per cent sodium acetate trihydrate are added.
17. Distilled water is added to the 50 ml. mark.
18. The Cenco Photelometer is set to read 100 with the contents of Flask No. 2 as described for blood and ascitic and cerebrospinal fluids, using the blue filter. The concentration of sodium in the urine specimen is read from the curve.

Results

The average value of the sodium concentration in human blood sera as determined on fifteen normal ashed samples was found to be 334 mg. per 100 ml. of blood; the range was 324 to 342 mg. per 100 ml. As determined on trichloroacetic filtrates of sera, the average was 341 mg. per 100 ml; the range was from 333 to 349 mg. per 100 ml. The average for ashed samples is in excellent agreement with the figure of 335 mg. per 100 ml. which

Peters and Van Slyke[10] gave as their findings for sodium concentration in serum. Trichloroacetic acid filtrates gave values from 0.9 to 4 per cent higher than ashed samples of the same serum. Hald[15] and Ball and Sadusk[2] also found that values for sodium are higher when determined on trichloroacetic acid filtrates than on ashed samples.

Calibration (Cenco Photelometer)

(1) Make up the Standard Solution:
   1. 9.1308 grams of uranyl acetate $UO_2(CH_3COO)_2 \cdot 2\,H_2O$
   2. 1.5745 grams of zinc acetate $Zn(CH_3COO)_2 \cdot 2\,H_2O$
   3. 0.9763 grams sodium acetate $Na(CH_3COO) \cdot 3\,H_2O$

   Make up to 500 ml. with distilled water. Dilute 1:10 with distilled water. (1 ml. = 0.330 mg. of sodium.)

(2) Set up thirteen 100 ml. volumetric flasks for the different dilutions of the standard. Make up each as indicated in the chart below, with the amount of standard, sulfosalicylic acid, and sodium acetate, specified.

(3) Read as for the unknown. Record.

Flasks	1	2	3	4	5	6	7	8	9	10	11	12	13
Standard in cc's.	0	2	4	8	9	9.5	10	10.5	11	11.5	12	14	16
Sulfosalicylic acid in cc's.	4	4	4	4	4	4	4	4	4	4	4	4	4
Sodium acetate in cc's.	4	4	4	4	4	4	4	4	4	4	4	4	4
NA in mg. per 100 cc blood	0	66	132	264	297	313.5	330	346.5	363	379.5	396	462	528

The concentration of electrolytes in the blood serum may be expressed either in terms of milligrams per 100 ml. or in terms of milliequivalents per liter, the latter being calculated from the former, according to the formula,

$$\text{Milliequivalents per liter} = \frac{\text{milligrams per liter} \times \text{valence}}{\text{atomic weight}}$$

Darnell's photoelectric method for the determination of sodium in biological fluids has been worked out also for the Evelyn colorimeter.[9]

Conclusion

A summary of the most recent developments in sodium metabolism is given. An accurate, simple, photelometric method for the determination of sodium in biological fluids is described.

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A STUDY OF YEAST-LIKE FUNGI ISOLATED FROM PATHOLOGICAL LESIONS

HELEN MENKEL, M.S., M.T.
Denver, Colorado

The role played by yeast-like fungi isolated from human infections is a source of confusion among many investigators. There are as many ideas as to the significance of fungi isolated from pathological lesions as there are types of fungi.

This study was undertaken in an effort to identify the types of fungi found in pathological lesions and to determine their pathogenicity and their power to produce agglutinins in the sera of those harboring the infection.

Many workers have reported the presence of yeast-like fungi in the lesions of man and believe that these organisms were the cause of the symptoms produced. From a total of 1452 cases reported by investigators of fungus found in pathological lesions, Monilia albicans was the organism isolated in 715 or 49.3%. (See Table I)

Table I
Reported Isolations of *M. albicans* in Pathological Lesions

Investigators	Date	No. Exam.	Where Isolated	M. albicans
Kronig	1894	200	Vaginal Tract	200
Herff	1895	24	Vaginal Tract	15
Peckham	1925	51	Throat & Sputum	38
Stovall & Greely	1928	18	Sputum	12
Stovall & Buboiz	1929	40	Sputum	37
Hopkins & Benham	1929	14	Hands & Feet	12
Ashford	1929	781	Feces	263
Hesseltine et al	1934	85	Vaginal Tract	28
Vayssier	1931	25	Vaginal Tract	25
Hopkins & Hesseltine	1936	73	Vagina & Mouth	35
Fisher & Arnold	1936	14	Gastric Contents	8
Fisher & Arnold	1936	57	T. B. Sputum	21
Black & Eddy	1937	1	Sputum	1
Davis & Warren	1937	1	Sputum	1
Jones & Martin	1938	68	Vaginal Tract	19
Total number of specimens examined				1452
Number diagnosed as M. albicans				715
Per cent of M. albicans isolated from pathological lesions				49.3%

Out of 33 strains used in this study, nineteen were isolated from sputum, five from the vaginal tract, four from throat, gums, and tongue, two from fingers and three from feces. (Table II) Three separate plants were made on Sabouraud's malt agar slants from each specimen so that the results would be of more value. This paper will not allow a description of the methods of identification which were used but they are all outlined in my original article. The methods were those as outlined by Benham and Stovall and Fisher et al. First planting on Sabouraud's malt agar slants, streaking growth on corn meal agar plates and gelatin stabs and examination for ascospores in old cultures. Maltose was the only sugar used in fermentation and litmus lactose milk was inoculated from each culture.

Table II

Source of Cultures Isolated from Pathogenic Lesions and Symptoms

Case No.	Source	Symptons
1	Sputum	Chronic cough, night sweats, symptons simulating tuberculosis
2	Sputum	Chronic, cough, mild bronchitis. Wife of Case No. 1
3a	Sputum	Bronchiectasis
3b	Sputum	Same as above
4	Sputum	Severe cough, emaciation, marked bloody sputum
5	Sputum	Chronic cough for several months
6a	Sputum	Slight hacking cough, sore spots in chests. Hemoptysis
6b	Sputum	Same as above
7	Sputum	Mild cough with general malaise
8	Sputum	Chronic Bronchitis
9a	Sputum	Bronchiectasis
9b	Sputum	Same as above
10	Sputum	Asthma
11	Sputum	Chronic cough, hemoptysis
12	Sputum	Chronic cough
13	Sputum	Severe form of mycotic infection. High fever and symptons of pneumonia
14	Sputum	Symptons of pneumonia, hemoptysis, night sweats, followed by empyemia
15	Sputum	Came in with pneumonia. Died.
16	Sputum	Acute condition, hemoptysis, no pneumococci found
17–21	Vagina	Severe itching, burning, and profuse vaginal discharges
22	Gums	Constitutional symptons simulating rheumatic fever. Could not move arms or legs without severe pain.
23	Tonsils	Large white patches over fauces of tonsil after influenza
24	Mouth	Cauliflower-like patches inside mouth. Nursing infant. Bleeding surfaces after removal
25	Tongue	Case of Sprue. Tongue red and raw
26	Infected finger	Finger swollen and skin tender with pus exuding from base of nails
27	Base of thumb nail	Skin at base of nail swollen and spongy. Pus exuded on pressing.
28	Feces	A long standing case of Sprue with acute exacerbations from time to time
29	Feces	Acute diarrhea of unknown origin
30	Feces	A case of suspected Sprue

The identifications of the organisms by their biochemical and cultural characteristics are listed in Table III. Out of the 33 strains identified M. albicans was isolated in 25 cases. A total of 13 rabbits were injected intravenously. Nine died within four or five days and the organisms were recovered from the heart blood, kidney abscesses and urine. Blood cultures were made in dextrose broth and in one tenth per cent Sabouraud's agar from the heart blood. Smears and cultures were made from kidney abscesses, and the bladder urine was drawn off in sterile syringes and planted in dextrose broth. These nine strains which caused the death of the rabbits were identified as M. albicans. Tissue slides were made from the kidneys and heart and the organisms recovered.

Two different strains isolated from the same sputum were injected into rabbits. One, a Cryptococcus had no effect on the rabbit, but the second strain, an unidentified species of monilia caused death in ten days with a condition simulating meningitis but no organisms could be recovered from the blood or tissues. Two others were inoculated from an unidentified species from

Table III

Identification and Biochemical Characteristics of Strains Isolated from Pathological Lesions

Case No.	Fermentation Maltose	Gelatin Stab	Coagulation Milk-days	Indentified
1	AG	Inverted pine tree	2	M. albicans
2	AG	Inverted pine tree	2	M. albicans
3a*	A	Inverted pine tree	0	Unidentified
3b*	O	Nail	...	Cryptococcus
4	AG	Inverted pine tree	...	M. albicans
5	AG	Inverted pine tree	...	M. albicans
6a*	A	Nail	0	Cryptococcus
6b*	....	Not done	...	Aspergillus
7	AG	Inverted pine tree	3	M. albicans
8	AG	Inverted pine tree	...	M. albicans
9a*	AG	Inverted pine tree	2	M. albicans
9b*	....	Fuzz	0	Unindentified
10	AG	Inverted pine tree	...	M. albicans
11 to 25	AG	Inverted pine tree	2–5	M. albicans
26	....	Liquefaction	...	Cephalosporium
27–29	AG	Inverted pine tree	...	M. albicans
28	A	Liquified	...	Unidentified
30	AG	Fuzz	0	M. Parapsilosis

A—acid G—gas —not done O—no fermentation or coagulation *—a and b were two samples from source.

feces and the other with a culture of Cephalosporium isolated from an infected finger. Neither of these rabbits died and no pathology was demonstrated. (See Table IV)

A total of fifteen serums were obtained from the individuals from whom the organisms were isolated and agglutinated with eighty-four strains of fungi. An average of five antigens were used for each antiserum. (Table V) Specificity was not demonstrable with any of the serums used. Strains of monilia which were morphalogically similar were agglutinated by the same antiserums to practically the same titers. Cultures which were identified as Cryptococci were not agglutinated by any antiserum. Serum from the individual harboring Aspergillus and Cryptococcus lacked agglutinins for the strains of M. albicans. Case

Table IV

Pathogenicity of Strains Isolated from Human Cases for Rabbits

Case No.	Time of Death	Pathogenicity	Organism Recovered
1	5 days	X	Heart blood kidney abscesses
2	4 days	X	Same as above
3a	10 days	X	None recovered meningitis
3b	Lived	O	None revocered no pathology
4	4 days	X	Kidney abscesses heart blood
5a	Lived	O	None recovered no pathology
13	5 days	X	Septicemia heart blood kidney abscesses
14	6 days	X	Same as above
15	6 days	X	Same as above
16	5 days	X	Same as above
17	5 days	X	Same as above
22	3 days	X	Same as above
26	Lived	O	No pathology
28	Lived	O	No pathology

O—No organisms recovered or pathology demonstrated in tissue sections.
X—Caused death.

Table V

Cross Agglutinations Between Patient's Serums and Strains of Yeast-Like Fungi Isolated

Sera From Case	Organism Identified as	*Titer of Agglutinations with Organisms from Case No.								
		1	2	3b	4	5	6a	7	8	9
		1:	1:	1:	1:	1:	1:	1:	1:	1:
1.....	M. albicans	5120	5120	40	5120	5120	160	....	....	....
6a.....	Cryptococcus	160	160	....	160	160	....	....	....	....
9a.....	M. albicans	5120	5120	....	5120	5120	....	....	....	....
10.....	M. albicans	320	160	10	80	....	....	....	....	....
12.....	M. albicans	5120	5120	....	5120	5120	....	5120	1280	....
13.....	M. albicans	40	320	40	320	....	....	....	....	....
14.....	M. albicans	640	1280	....	2560	5120	....	5120	5120	....
15.....	M. albicans	10	80	10	1280	160	80	160	....	....
16.....	M. albicans	2560	2560	....	160	80	....	....	....	....
20.....	M. albicans	5120	5120	....	160	640	....	640	....	....
22.....	M. albicans	5120	5120	10	5120	5120	10	5120	5120	....
23.....	M. albicans	5120	5120	20	5120	640	160	640	640	....
26.....	Cephalosperium	5120	5120	1280	640	1280	640	5120	2560	1280
28.....	Unidentified	640	640	20	640	....	....	....	....	....
30.....	M. parapsilosis	160	160	10	320	40	....	....	....	....

* Titer of agglutinins was taken as highest dilution where any agglutination could be demonstrated.

No. 26 from whose finger Cephalosporium was isolated had antibodies in his serum against all of the strains of monilia and also a strain isolated from a baker's yeast cake. This young man was a dishwasher and was constantly having infected fingers which might account for the results with his antiserum. Serum taken from acute cases during time of infection did not show agglutinins in very high titer. In one case of thrush which caused severe constitutional symptoms, agglutinins were demonstrable to the highest titer two years after the infection. (Case 16) One serum taken four years after an attack of severe bronchomoniliasis showed agglutinins only in the lower dilutions. (Case 13) The antiserum from the case of asthma showed a low titer of agglutinins for all strains. (Case 10) The monilia in this case seemed to be only a secondary invader as iodides gave no relief of symptoms. The antiserum from the case of sprue only showed a low titer of agglutinins which bears out the theory held by most authorities that the monilia found in the feces of those who have sprue has no bearing on the symptoms but is there only because conditions in the intestines are favorable to its growth.

Out of 84 strains used as antigens 27 were agglutinated in the 1-5120 dilution or full titer, six to 1-2560, eight to 1-1280, ten up to 1-620, four to 1-320, 13 to 1-160, and the remaining 17 in dilutions below 1-160. The titer of human antisera went to higher dilutions than the titers built up in rabbit serums as recorded by Benham (1931). Her highest reported dilution was 1-1000.

In her experiments the agglutination of rabbit sera was as follows:

Out of 15 antiserums used against 103 antigens, 12 strains were agglutinated in dilutions of 1-1000 or to the full titer; 20 had a titer of 1-500; 16 1-200; 22 1-100, and 33 strains in the lower dilutions.

The serums of 15 normal individuals were used against these same cultures isolated from humans (Table VI). The agglutination titers of these normal serums were too low to be of any significance. Only one serum showed ability to agglutinate any of the antigens in dilutions above 1-640. Forty-six antigens were not agglutinated in any dilutions, four were agglutinated to 1-320 and the remaining 39 were agglutinated in dilutions below 1-160.

Todd (1937) did agglutination tests on 1,150 normal persons and found that three per cent showed titers of 1-160 or above. Twenty-six yielded reactions of 1-160 and the remaining positive serums showed titers of 1-80 or less and 878 were negative. She also found that persons whose serum agglutinated in the higher titers, had M. albicans present in the nose and mouth.

I did not check on the normal cases who showed a high titer of agglutinins for the presence of M. albicans.

Table VI

Cross Agglutination Between Normal Human Serums and Strains of Yeast-Like Fungi Isolated

	*Titer of Agglutinations with Organisms from Case No.					
	1	2	3b	4	5	7
Normal Serums No.	1:	1:	1:	1:	1:	
1	80	160	0			
2	40	20	0	80		160
3	40	1280	0	20	0	
4	20	320	0	40	40	
5	0	0	0	0	0	
6	640	80	320	0	0	0
7	40	40	0	0	0	0
8	80	160	160	0		
9	20	40	20	40	0	
10	20	0	0	0	0	0
11	20	80	0	0	0	20
12	0	0	0	0	0	
13	80	80	20	0	0	0
14	0	0	0	0	0	
15	0	0	0	0	0	

* Titer of agglutinins was taken as highest dilution where any agglutination could be demonstrated.

Discussion

Thirty-three cultures of yeast-like fungi were isolated from pathological lesions. Twenty-five, or 76 per cent, were identified as M. albicans. The material was all taken from individuals who were having distinct symptoms of infection. The treatment by iodides or local fungicides of those patients harboring fungi resulted in a reduction in the number of organisms or by their complete disappearance accompanied by clinical recovery. From

this fact it appears probable that the yeast-like fungi were the actual cause of the symptoms in these patients.

M. albicans has not been isolated from normal skins which again makes it apparent that infections of the skin from which M. albicans has been isolated are probably caused by this species of Monilia.

M. albicans was the only species isolated in this study which proved pathogenic to rabbits when given in small amounts by intravenous injections. This agrees with the results of all investigators who have done animal inoculations of yeast-like fungi.

M. albicans also was the sole species of Monilia which caused the coagulation of bromcresol purple milk in from three to five days. This agrees with the investigations of Stovall and his coworkers.

Agglutination tests on the serums of those harboring these yeast-like fungi demonstrates that the body produces antibodies against these organisms. Antibodies remained in the serum for as long as two years after a severe infection and showed a high titer of agglutinins. Agglutination reactions produced in rabbits for Monilia have not shown specificity for type species. This was found true also with the human serums used in this study.

M. albicans was the only species of Monilia which was pathogenic to animals and it was the species found most frequently in material from pathological conditions.

It was not possible to place all yeast-like fungi isolated into any of the well defined groups of Monilia. Those strains which were not identified were not found to be pathogenic to rabbits.

In nearly every instance where two or more species of yeast-like fungi were found growing along together in any specimen, M. albicans was isolated as one of the type species present. In two cases M. albicans was not the species isolated but Aspergillus was present. The Asperigilli are capable of causing symptoms of infection when present in or on body surfaces.

Summary and Conclusion

1. During these studies incubating cultures of yeast-like fungi at room temperature was better than at body temperature because of the excessive growth of bacteria at 37° C.

2. The species M. albicans may be identified without the aid of carbohydrate fermentation reactions. Morphology of this group of organisms on cornmeal agar plates and pathogenicity for rabbits when given intravenously proved sufficient for identification in this study.

3. M. albicans was the species most frequently isolated from the specimens examined from pathological material containing yeast-like fungi, and apparently is the species which is most important clinically in medical mycology.

4. Individuals in which M. albicans grew in body cavities or on skin surfaces had distinct symptoms which disappeared when the organisms were destroyed.

5. In acute conditions, these yeast-like fungi often were the predominating organism isolated, tending to support the premise that they were the primary cause of infection.

6. Agglutination of yeast-like fungi by serums of persons harboring these organisms demonstrated reactions similar to serum reactions against bacteria.

7. Normal human serums failed to agglutinate the strains of fungi in sufficiently high dilution to be of any consequence.

8. Granules were present in material heavily infested with these yeast-like fungi. These were picked and examined or planted on culture media. They were found to be characteristic of the presence of Monilia.

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WANTED

Qualified registered medical technologist (ASCP) for general duty, 325 bed general hospital; 7 technicians; 44 hr. week; approved school of medical technology; salary commensurate with training and experience. Apply to C. L. Blumstein, M.D., Pathologist, St. Rita's Hospital, 801 West High St., Lima, Ohio.

THE LYMPHOCYTE IN VIRUS DISEASES*

BEN FISHER, M.D., ANDREW RANIER, M.D.,
and FRANKLIN L. CRAWFORD, M.D.
From the Clinical Laboratories (Special Hematology), U. S. Marine Hospital, New Orleans

In the late winter and early spring of each year, there is a sudden increase in the incidence of virus diseases. These are usually accompanied by symptoms of general malaise, fatigue, headache, retrobulbar tenderness, myalgia, and usually a mild elevation of temperature. Cervical lymphadenopathy may be present or absent. Concommitant with these symptoms, various unusual changes are seen in films of the peripheral blood. Chief among these, is the presence of large, darkly-staining, atypical mononuclear cells. These are frequently a source of consternation to technicians who are not familiar with them, or who are not continuously engaged in hematologic technology. The retention of such terminology as "irritation forms" or "Turck cells" adds further confusion to this problem. These cells are young lymphocytes, not unlike those seen in the peripheral blood in infectious mononucleosis. Sometimes, the nuclear chromatin is immature and reticulated, and the cell may then be confused with a "blast" form. The leukocyte count may be normal or elevated, but it is usually depressed at the onset. A slight eosinophilia may be noted in the recovery phase. The principal diagnoses which must be considered include mild influenza, prodromal stages of virus hepatitis, the viral exanthemata, and infectious mononucleosis. Usually, several distinguishing features may be found in the history, physical examination, or other laboratory tests. It is our impression that the diagnosis of infectious mononucleosis is too often made on the presence of these atypical cells in the blood, without recourse to confirmatory procedures. Infectious mononucleosis is no longer regarded as a hematologic curiosity, but is known to be generalized virus infection which may involve the heart, liver, spinal cord, or brain.[1] The only means of differentiating this specific entity from the other virus diseases lies in the demonstration of a positive serum agglutination test for sheep erythrocytes (heterophile antibody test).[2] The atypical lymphocytes may be found in any of the virus diseases. However, it is not enough to perform the routine heterophile agglutination test, since it has been shown that positive agglutination in the "diagnostic" titer (1:56 or higher) may occur in diseases other than infectious mononucleosis.[3] Therefore, it is necessary to use the Davidsohn differential absorption test (guinea pig kidney) for confirmation of the presence of a true heterophile antibody.[2] The value of this test is demonstrated in case 1 of our series.

* Received for publication 4/25/50.

The atypical cell mentioned before, is large (15-16 micra), and has a relatively large nucleus. The cytoplasm stains either a pale blue or a very dark blue with Romanowsky stains, and discrete red granules may be seen in the cytoplasm of the lighter staining cells. These are not unlike the large lymphocytes normally seen in the peripheral blood of children. However, one feature appears fairly constantly in the virus diseases. In areas of normal cell distribution, where mechanical factors are minimized, these cells tend to adhere to and follow the outlines of the adjacent erythrocytes. The rolled, irregular cytoplasm margin then stains darkly basophilic. This phenomenon has been noted in the smears, whether made on slides or cover slips. Vacuolization of the cytoplasm is not regarded as a significant feature, since it is seen quite frequently in young (fragile) or old (degenerating) cells of all kinds. Examples of characteristic cells are shown in Figures 1 and 2.

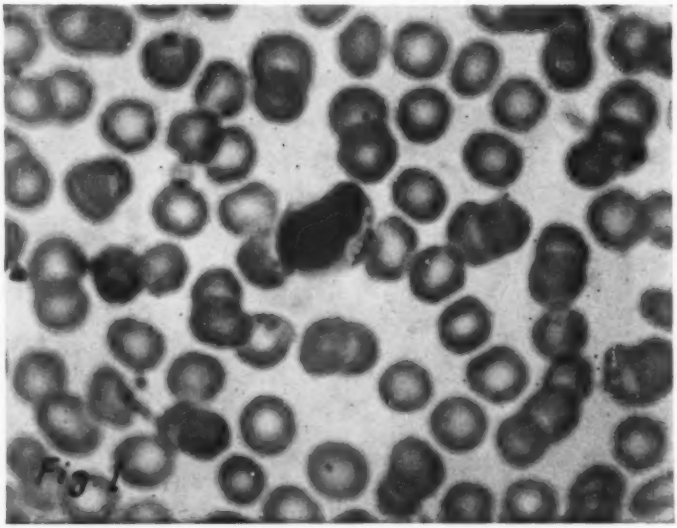

Figure 1—Large atypical mononuclear cell—oil immersion.

Case Reports

Table I presents a summary of the pertinent data in 8 cases which showed the presence of an increased number of the atypical lymphocytes in the peripheral blood. In each instance of a positive heterophile agglutination, the differential absorption test

was also performed. Special mention need be made of only a few cases.

Case 1—This patient was studied by the Special Hematology Laboratory because of his leukopenia on admission. The history and physical examination did not aid materially. A few of the atypical cells were noted on the blood smear, and the heterophile agglutination was positive in a dilution of 1:448. The patient denied any recent parenteral injections or oral medications, and had no exposure to toxic chemicals. One week later, the heterophile agglutination was still positive at 1:448, and remained at this titer throughout his hospitalization. In each instance, the agglutination was negative after the serum had been absorbed with guinea pig kidney suspension.

Case 2—Proper consideration must always be given to the "inverted" differential cell count which is normally present in young children. Their response to most infections is lymphocytic.

Case 4 and 8—These were confirmed cases of infectious mononucleosis and are included in this series for comparison.

Case 6—This was a typical case of chicken pox, with the characteristic skin lesions.

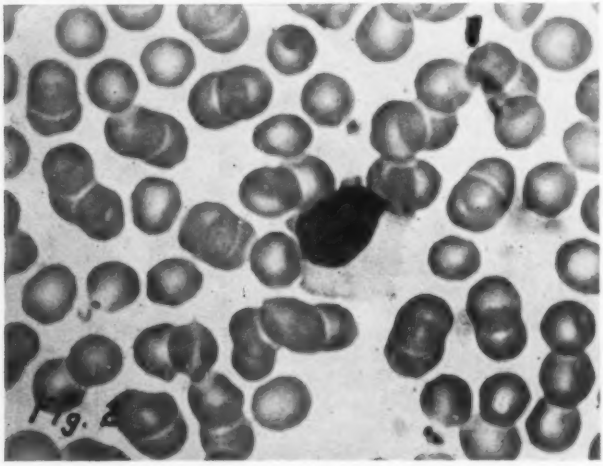

Figure 2—Large atypical mononuclear cell ("sticky" type)—oil immersion.

Discussion

It is not difficult to explain the presence of these immature lymphocytes in the peripheral blood of patients with virus diseases when one considers the genesis of the lymphocyte. Sundberg[4] has shown that the definitive lymphocyte is derived

Table I

Case	Name (Age)	Admitting Diagnosis	Discharge Diagnosis	Pertinent Findings	WBC (c.mm.)	% Lympho-cytes*	A Typical Lymphocytes (in % of Total Lymphocytes)
1	F.D. (23)	Fever of undetermined origin	Same	Malaise; slight fever; few enlarged cervical lymph nodes; Heterophil 1:448, negative after absorption.	2,525 (11% eos.) 8,225 (16.5% eos.)	42% 37%	occasional 7%
2	R.C. (2½)	Mild influenza	Same	General lymphadenopathy; sore throat; fever; Heterophil-negative.	5,600 (8% eos.)	85.5%	22%
3	D.B. (18)	Influenza	Same	Malaise; prespiration; chilly; sore throat; myalgia. No lymphadenopathy. Temp. 101°. Heterophil-negative.	3,100 (1%eos.) 6,100 (5% eos.)	47%	57%
4	R.P. (25)	Left kidney stone	Infectious mononucleosis	Enlarged spleen; general lymphadenopathy; malaise; slight fever; abdominal pain. Heterophil, 1:224.	13,400	81%	15%
5	J.B. (29)	Influenza	Same	Malaise; arthralgia; fever. Heterophil-negative.	3,300	32%	occasional
6	M.L.H. (4)	Chicken Pox	Same	Characteristic skin lesions.	4,900 (2% eos.)	64%	many
7	G.W. (37)	Psychoneurosis Alcohol addiction	Same	Phys. exam. not remarkable. History of hepatitis and virus pneumonia in 1947.	14,100 (2% eos.)	35%	17%
8	W.W.C. (18)	Tonsillitis	Infectious mononucleosis	Ulceration of tonsil with infection; splenomegaly; general lymphadenopathy. Heterophil—1:7968 (last dilution made).	12,200	56%	75%

* 200 cells enumerated in differential count.

from an earlier reticular lymphocyte, which is a large cell and has a large nucleus and dark basophilic cytoplasm (Figure 3). It is best demonstrated in imprint preparations of lymph nodes. These cells are increased in number in lymph nodes exhibiting all types of hyperplasia. One would then expect to find them increased in virus diseases, which are lymphotrophic. This process is analogous to the "shift to the left" in the granulocytic series. It should not be considered unusual then, to see later stages of these reticular lymphocytes in the peripheral blood in conditions associated with lymphoid hyperplasia. Rebuck considers these cells as "hypertrophied lymphocytes," and feels that the morphologic change is coexistent with the increased physiologic function of the lymphocyte as it assumes the characteristics of a macrophage.[5]

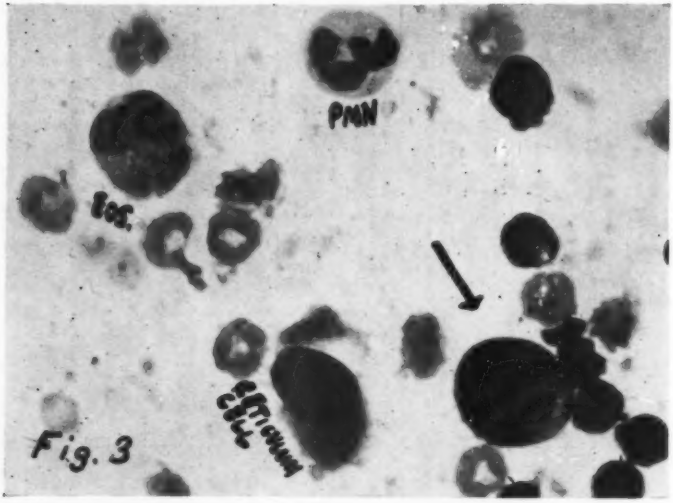

Figure 3—Large reticular lymphocyte (from imprint of hyperplastic lymph node)—oil immersion.

Summary

Eight cases of common types of virus diseases are presented, in which the peripheral blood contained increased numbers of young and atypical mononuclear cells. These cells are believed to be later forms of the reticular lymphocyte demonstrated by Sundberg. A concept is advanced of "left shift" in the lymphoid cells, as seen in the virus diseases accompanied by lymphoid hyperplasia. A diagnosis of infectious mononucleosis cannot be

made from the presence of these cells, but must be confirmed by a positive heterophile agglutination test after absorption of the serum by suspension of guinea pig kidney.

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A NEW IODINE PREPARATION FOR THE STAINING OF PARASITIC OVA AND CYSTS

ARNOLD L. SWANCARA A.B.
Tucson, Arizona

The formula for a parasitic stain presented in this article has incorporated in it not only the usual halogen component iodine as its basic dye substance but ingredients, that workers in the field of Glycol-gel have pointed to with strong emphasis, that will enhance the penetration factor of stains into the deeper tissue layers as well. It was observed that where experiments were conducted without strict adherence to the principles laid down by investigators in this field a solution of only weak and superficial staining qualities was produced.

The principles of dye penetration are illuminating and worth reveiwing briefly. Brown and Reid (1943) maintain that the usefulness of a stain depends upon its diffusibility in Glycol-gel. Stearn and Stearn (1930) as well as Holmes (1929) conclude that the theory of either chemical interaction or the absorptive power of dyes with tissue substances is predicated upon the absorption factor in these gelatinous materials. An interesting observation along these same lines is brought out in the writings of Mommsen (1926) and Pischinger (1927) where it is pointed out that acid stains diffuse more readily in less acid substances while basic ones do so with equal intensity in less basic media.

With these observations fully in mind it was found that a stain could be produced by merely utilizing the chemical formula of iodates (IO_3) oxidizing iodides in the presence of an acid. With the use of acetic acid as supplying the positive ion and potassium dichromate as the primary oxidizing agent then iodine is liberated according to the following equation:

$$K_2Cr_2O_7 + 6KI + 14(C_2H_4O_2) = 2Cr(C_2H_3O_2)_3 + 8KC_2H_3O_2 + 3I_2 + 7H_2O.$$

The ingredients here included contain the essence of a stain that embraces the entire gamut of parasitic ova and cysts and by

proper adjustment to strength may be used in the following proportions:

Potassium dichromate .....0.4 grams
Potassium iodide .....1.8 grams
Dissolve separately in about 25 ml. of distilled water and add:
Acetic acid .....1.6 ml.

Make up to 100 ml with distilled water. The solution when placed in amber colored glass-stoppered bottles retains its potency for many months.

The stool may be prepared in the usual manner for flotation methods and the harvest of ova and cysts reaped on an inverted ⅞ cover glass superimposed on the suspension at the brim or lip of the test tube or by mixing a small kernel sized portion of the feces with saline. A drop of the above stain is placed on a clean dry slide and, if the flotation method is used, the coverslip with the fecal suspension hanging from its under surface is lifted from the tube and the adhering drop is allowed to fall into the stain and the contents mixed thoroughly with the edge of the coverglass. Place the coverglass over the mixture and examine under the microscope. If the saline method is used one drop of stain with one drop of the mixture is prepared in the same manner. By using too large a drop of the stain one may meet with some overstaining. This may be overcome by a reduction in the size of the drop. The resultant staining qualities thus attained naturally take on the brown coloring much like that found when using Lugol's but with infinitely sharper detail.

Discussion

The method here devised is primarily intended for rapid diagnostic work so that no attempt has been made to attain permanent mountings. This may always be accomplished later by slower methods. The stain is easily prepared and ready of application. The color penetration imparts outstanding detail into the body substance in a short interval of time. Nuclei of cysts are black and stand out in sharp relief against a yellow cystic substance.

A thorough search of the literature fails to reveal any similar formula nor have any of the present day methods been patterned along lines discussed in this paper.

Conclusion

It may be definitely concluded from these studies that where the penetration factor as worked out by investigators in the field of Glycol-gel has been incorporated in a parasitic stain as here presented, more detail of essential markings may be demonstrated and hence much of the doubt that so often exists in the minds of workers in parasitology may be removed.

Summary

In summarizing the salient features of this paper it is to be noted that: (1) iodine is the ingredient of choice in rapid methods of staining ova and cysts, (2) basic principles of penetration factor worked out in the field of Glycol-gel should be observed (3) the formula is predicated on an established chemical reaction and (4) that the resultant product brings out sharp lines of diagnostic markings.

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PREPARATION OF LARGE PARAFFIN TISSUE SECTIONS FOR LANTERN SLIDE PROJECTION

ALVINA HENNING, M.T. (ASCP)

Fitzsimmons General Hospital, Denver, Colorado

Every tissue technologist cuts paraffin sections, but few have made an effort to cut large sections suitable for mounting on lantern slides. The procedure here described presents nothing new. However, it emphasizes several points of technique at which patience and care must be exercised if large sections are to be cut satisfactorily. Sections at least 4 cm. in cross section repeatedly have been cut. These large sections, mounted on lantern slides, have proved to be exceptionally valuable for teaching purposes.

In the work here described a piece of tissue 1 cm. in thickness was cut by the pathologist from a squamous cell carcinoma which had been removed by resection of the mandible and neck. The sections were cut with a 250 mm. knife at a thickness of 6 microns. They were mounted on 3 x 4 lantern slides. A rotary Spencer microtome, No. 820 was used. The procedure, including mounting and trimming of the paraffin block, sharpening of the knife manually after it had been on the automatic sharpener for three hours, sectioning of the tissues, and mounting of the sections, was done without hurry in two hours. In this discussion, the term "free surface" refers to that surface of the paraffin block from which the sections were cut.

The fresh tissue was fixed and prepared for embedding by well known standard procedures. Routinely, in our laboratory, some of our tissues are prepared manually and others with the use of the autotechnicon. In either procedure, the tissues are fixed in 10% formalin and cut at a thickness of ½ to 1 cm.

After the tissues are fixed in formalin and cut, they are placed in 70% alcohol all day, in 95% alcohol overnight, in three different changes of absolute alcohol (1½ hours in each), in two different changes of chloroform (1½ hours in each), and in chloroform and paraffin overnight. The next morning they are placed in three changes of paraffin (1½ hours in each) and embedded in a pan of paraffin. The paraffin should be cooled rather quickly. As soon as the tissues have been embedded, set the pan in a cold water bath. As the paraffin begins to set, run cold water from the tap onto it. Do not cool the paraffin too long, as it has a tendency to crack if it gets too cold. When the paraffin has set throughout the pan, the cooling should be discontinued and the cake removed from the pan.

With the autotechnicon the following schedule is used: 70% alcohol, 3 hours; 95% alcohol, 3 hours; absolute alcohol, 3 changes, 2 hours each; chloroform, 2 changes, 2 hours each; chloroform and paraffin, 2 changes, 2 hours each; paraffin at 56° C., 2 changes, 2 hours. Embed.

With several single folds of newspaper on the table under the knife to catch the waste obtained from trimming the paraffin block, one is ready to make preparations for sectioning. Set the constant temperature water bath at 40° C. In mounting the paraffin block, make certain that the surface of the block which is to be melted onto the metal holder is plane. Use a large holder with a diameter of at least 4 cm. on its flat surface. The holder must *not* be centered on the block, but rather is placed below the center with the edge of the holder flush with the bottom of the block (which will be toward the table when the block is in position in the microtome). Also, with the block in position for cutting, the two sides of the block perpendicular to the free surface and vertical to the table *must clear* the outside supports for the knife. Accordingly, the supports will have to be pushed apart as far as possible; otherwise, the block will be knocked off the holder by the supports the first time the handle of the microtome is turned. In the work described here, the paraffin block was trimmed from a width of three inches to two and one-half inches. Also, the two lower corners of the block were cut off, and considerable trimming was done on the back side of the block, on either side of the holder, to allow for clearance of the paraffin block with the base of the microtome. When the block has been sufficiently trimmed, place it, with its free surface down and with metal holder up, on a cake of ice.

The next step is of great importance. Make sure you have a good knife, one with which you have had experience and which has been properly cared for. Preferably, use a knife which is used by no one but you. There is no choice between a knife that is fairly sharp and one with a perfect cutting edge. To sharpen the knife manually after it has been on the automatic sharpener, proceed as follows: Scrape the razor strop with a razor blade to remove dirt and old rouge. Be careful not to cut the strop. A piece of adhesive tape over the side of the blade which is held between the fingers makes it convenient to handle the blade. Next, rub the strop with a clean cloth to remove any loose dirt. Then rub the strop with jeweler's polishing rouge, obtainable at any drug store.

Strop the knife back and forth many times. Then put several drops of xylol on each side of the knife and wipe off the xylol with a clean, dry cloth. To wipe off the xylol, make a fold of several thicknesses of cloth, place the knife in the fold with its cutting edge up, and wipe the knife on both sides at the same time. *Never allow the cutting edge to touch the cloth,* for if it does it will be instantly dulled. Lastly, stroke the knife toward its cutting edge *and up to its edge* against the clean palm of your hand. In this last step dust and lint, present in appreciable amount, is removed from the cutting edge.

Inspect the cutting edge under the low power of the microscope. Repeat the stropping as often as necessary. The cutting edge must be perfect. Do not compromise on the sharpness of the knife.

When the knife is sharp, secure it in the microtome in such a position that the first cutting will be done with one end of the knife, not with the middle portion. Fasten the metal holder, with the mounted tissue block, in position. Begin cutting. Continue until you secure a complete cross section of the tissue. Now move the knife to its unused portion. The block should now be cooled by holding a flat piece of ice against its free surface without removing the block from its position in the microtome. The sections should come off in "ribbons," and the ribbons must be complete and have no skips. If you do not have complete ribbons you do not have a sharp knife.

Do not use the first section of a ribbon. Due to temperature changes, this section does not have the thickness for which the microtome is set. A tissue technologist who takes the first section usually mounts one that is much too thick.

Keep the block cold by holding a flat piece of ice against it for 30 to 60 seconds each time before a ribbon is cut. The handle of the microtome must be turned slowly. If it is turned too fast, the sections show parallel lines or wrinkles, corresponding to horizontal lines on the block.

Mount the sections on scrupulously clean lantern slides which have been rubbed with egg albumin. Small bubbles of air which may have been trapped between the tissue section and the slide can be removed by gently tapping the wet tissue section with a dry finger.

If white spots or streaks are present in the tissue block, the tissue was not sufficiently dehydrated; it should have been left in absolute alcohol longer. If the tissue is not well cleared and infiltrated, it should have been left in chloroform longer.

With adequate care and patience, sections as large as 4 to 5 cm. in cross section and with a thickness of 6 microns can be cut without difficulty with a rotary Spencer microtome.

REPORT OF REGISTRY OF MEDICAL TECHNOLOGISTS
Of the American Society of Clinical Pathologists*

LALL G. MONTGOMERY, M.D.
Chairman, Board of Registry

It is a pleasure to be able to be with you on the occasion of another annual meeting of the American Society of Medical Technologists, and I bring you greetings from the Board of Registry of Medical Technologists. It is also a privilege to give a brief report of some of the past year's work, and some of the recent developments in the work of the Registry.

Change in Membership of Board of Registry

No doubt all of you know that the Board of Registry is now made up of six pathologists who are members of the American Society of Clinical Pathologists, and three medical technologists who are members of the American Society of Medical Technologists. As you know, the Board members from your Society are your immediate past president, Miss Rachel Lehman, your president, Miss Ida Reilly, and your president-elect, Miss Vernal Johnson. Representation on the Board of Registry marks a definite turning point in the progress of your society, and in the few months that they have been active members of the Board, your representatives have proven the premise that such a change would work to the advantage of all concerned. I use the word "active" advisedly, as there is indeed nothing static about the work of the Board of Registry, either during the concentrated Board meetings which are held for a period of two long days just preceding the annual meetings of the American Society of Clinical Pathologists, or in the months that intervene between meetings. It is true that the problems that come to the attention

* Read before Convention, 1950, Houston, Texas.

of this Board are more concentrated at the time of its annual meeting, but there are many problems that must be referred to it all through the year, by correspondence.

All of us who are members of the Board of Registry are honored to have been elected to such membership, but it is possible that we do not fully realize, until we actually are at work, just how many and varied are the problems that come within the scope of the Board's responsibilities, and with what care and thought each problem is approached and resolved.

Incoming Mail

For many years we have kept a daily count of mail received at the Registry office, because that is one way that we can judge the extent of work in the office, can watch the flow of work, and can thus determine which department is carrying an increasing load and needs more help in order to function properly. And so I thought a few of the figures on incoming mail might be interesting to you.

Table I
INCOMING REGISTRY MAIL

Total mail 1949-50 (excluding examination papers)	38,917	
This included:		Year Increase
Inquiries	7,040	1,628
Applications	2,024	225
Renewals	10,994	665
Orders (Jewelry, emblems, curriculums)	1,351	221

You will notice in Table I that the total number of pieces of mail received in the Registry office during the fiscal year ending April 30, 1950, was 38,917, exclusive of the examination papers. This was an increase of 3,833 pieces over the previous year. We found that we had received 7,040 general requests for information about the profession of medical technology, an increase of 1,628 over last year. The number of applications received was 2,024, or an increase of 225 over the previous year. The number of renewal applications received at the end of April, 1950, was 10,994, or 665 more than the number received the previous year. The number of orders, which includes orders for jewelry and emblems, as well as orders for the *Curriculum for Schools of Medical Technology*, was 1,351, or 221 more than last year. Not shown in this table, but significant nevertheless, is the fact that in the class of mail which we list as "miscellaneous," we had an increase of 893 over the figure for the previous year, which made the figure 4,629 for this year. Each piece of mail in that 4,629 had to be handled and taken care of by at least two, and usually more, of the girls in the Registry office, so this is a figure to be considered.

The actual figures I have just shown you are interesting to us at the Registry office in themselves, because as I have indicated, they tell us a great deal about the flow of work, the increase of work, and therefore the need for increasing the staff. But in a broader sense, these figures are interesting because they give us an indication of the effectiveness of the work that we have been doing for some time past, and the work that the members of the American Society of Medical Technologists have been doing. These figures tell us that the efforts of the Board of Registry, the American Society of Medical Technologists, and other interested workers, toward publicizing and recruiting for this profession, have actually been bearing fruit. We believe that this is particularly true as we evaluate the fact that more than 7,000 requests for general information about this profession were received in our office last year; some place along the line more young people are not only learning about medical technology, but also they are finding that certain basic college training and technical training are necessary in order to become adequately trained in this profession. Included in the category of mail designated as "miscellaneous," are many letters which must be answered by more than just a booklet and a list of approved schools of medical technology, letters in which certain specific questions are asked. We have been interested to note that the questions in such letters show a greater understanding of the work in this field, and of the requirements for certification. This is definite evidence of the fact that someone has laid a good foundation, which has enabled these young people to present their problems in an intelligent fashion, so that we in turn are able to give them the most help possible. It is indeed encouraging to have such specific proof that the intensive publicity and recruitment programs that have been carried on for the past few years, have been effective. The Board urges all of you to continue these excellent projects, since, as we cannot repeat too frequently, recruitment and publicity must be carried on continuously in order to reach the new groups of young people who are ready for such information each year.

Publicity Material Sent Out During the Year

Table II

PUBLICITY MATERIAL SENT OUT FROM REGISTRY OFFICE 1949-50

High School Booklets	11,237
Regular Booklets	10,548
Approved School Lists	10,763
Grand Total	32,548

Another concrete example of the fact that the various groups of medical technologists and pathologists are doing a fine job of publicizing the profession of medical technology, is found in

the amount of various publicity material sent out from the Registry office last year. In Table II we see that we sent out a grand total of 32,548 pieces of such material, which included 11,237 High School Booklets, 10,548 Registry booklets of information, and 10,763 lists of Approved Schools of Medical Technology. Sent out in bulk, and/or in answer to general inquiries, were 28,267 booklets and lists of schools, which constituted the greater portion of the total material sent out. However, I do want to mention that in answer to letters received from persons who had read the article on medical technology in the February, 1950, issue of *Seventeen* magazine, we had mailed a total of 961 booklets and the same number of lists of schools, by the end of April, and requests from readers are still coming in. We had hoped to have reprints of this very excellent article at our exhibit booth, so that those of you who want to use them in your publicity and recruitment programs could have them, but we have just heard that these reprints will not be available for a few weeks, yet, due to unforseen difficulties in preparing them. They will be available later, however, and may be obtained from the Registry office.

Other Mail Sent Out

Many of the duties in the Registry office are so routine that it sometimes is rather a shock to us who are so close to the work, to find that in the course of a year's time we have mailed a tremendous number of pieces of mail of various kinds. I have already told you that last year we mailed either in bulk or by individual mailings 32,548 booklets and approved school lists. In addition to this, we estimate that we have mailed at least 140,800 other pieces. I shall not give you a complete break-down of this list, but will simply say that included in this list are six mailings of the *Technical Bulletin;* renewal blanks (a complete mailing December 1 and an additional mailing of second requests in the spring); the many letters and forms in connection with the examinations, such as acknowledgement letters, references, schedule letters, letters informing the candidates whether they passed or failed the examination; letters to the Approved School Directors informing them of the results of the examination of their students; certificates; examination papers; letters to examiners regarding supervising the examinations; notices to the Approved School Directors regarding the dates of the examinations; notices to candidates having pending applications regarding the date of the next examination; cards and seals to registrants; notes to registrants who have not completed their renewal blanks; cards or letters to registrants regarding change of address and/or the fact that their *Technical Bulletins* have been returned; letters written by Mrs. Drummond and letters which

I have dictated; letters to our Board members; letters to pathologists and candidates for the examination, regarding their failure to pass the examination, and even an occasional analysis of their papers; and innumerable letters regarding many other items too numerous to mention here. Usually we consider that all of these things are so routine that they are not worth mentioning in an annual report, but this year we thought we might like to have at least a brief discussion of this phase of the work in the Registry office.

Transcript Evaluations

Table III

TRANSCRIPT EVALUATIONS 1949-50

Originals	2,301
Copies and Revisions	1,084
Total	3,385

The work in the Registry office has grown so steadily over the past few years, that sometimes we are not entirely aware of the extent of the growth until we have occasion to take stock and see how we can give better service. For instance, the last time we found it necessary to add someone to our staff, we examined our mail count to determine where some of the added work was coming from. We found that a large part of it was due to the fact that we were receiving many more transcripts for evaluation than we had in the past. We found, as shown in Table III, that we had made 2,301 original transcript evaluations, and 1,084 copies or revisions, during the year just ended. A total of 3,385 transcript evaluations a year, exclusive of the ones we evaluate in connection with applications for the examinations, may not mean much to one not working in the Registry office, but the Registry office staff can vouch for the fact that taking care of that number of evaluations is no small task. We have not kept a record of the number of letters that have been written before a correct evaluation can be made in many instances, but we know that this would run into the hundreds. Great care must be taken to weigh and evaluate the courses in the light of the Registry requirements, and we spare no effort to make the evaluations as accurate as possible. As you all know, our reason for making transcript evaluations is that the Council on Medical Education and Hospitals of the American Medical Association and the Board of Registry suggest that the Approved Schools of Medical Technology should have evaluations on file, before students are accepted for training. And so, part of the explanation of the great increase in numbers of transcripts to be evaluated, is the fact that there has been such a great increase in the number of Approved Schools.

Approved Schools of Medical Technology

Table IV
APPROVED SCHOOLS OF MEDICAL TECHNOLOGY

Number in 1935	41
Number in 1940	155
Number in 1945	256
Number in 1950	436
Approximate student capacity	3,000

We thought you might be interested in knowing just how the list of Approved Schools has grown in recent years. In Table IV you will see that in 1935 there were only 41 Approved Schools; the number had increased to 155 by 1940; in 1945 there were 256, and the latest published list shows that there are now 436 Approved Schools. We estimate that there is a student capacity of about 3,000, although it is doubtful if all of the schools are training up to their full capacity. If they were, it is possible that the shortage of adequately trained medical technologists might be alleviated to some extent, but the fact that 96 per cent of the registered medical technologists are women, and attractive ones at that, means that a number of them will eventually become wives and mothers, and retire from active professional life. Many of these who have left the profession maintain their registration each year, and we have estimated that about one-fourth of the registrants fall into this category.

Not long ago we took the time to examine the annual report to the Council on Medical Education and Hospitals, of 404 of the Approved Schools. Of especial interest to us were the statistics regarding the number of medical technologists employed in the laboratories of the institutions in which the Approved Schools are located. We found that in the 404 schools, there are employed 3,904 full time medical technologists. Of this number 2,296 or 58.8 per cent are registered medical technologists. There are 77 schools in which all of the medical technologists employed are registered; this represents 18.8 per cent, of the schools studied.

In the annual report form submitted to the Council by each Approved School of Medical Technology, the question is asked of the Approved School Director, "Are students required to take the national examination for registration by the Registry of Medical Technologists?" Of the 397 schools replying to this question, 308 said that it is required that their students take the Registry examination; 43 said they urged the students to take it; 46 said it was not required. It is interesting and encouraging to note that 77.7 per cent of the Approved Schools require that their students take the Registry examination as a final test of their ability in this profession.

Board of Schools of Medical Technology

As reported by the Board of Registry in the *Technical Bulletin* for March, 1950, (p. 303), the American Society of Clinical Pathologists at its meeting in October, 1949, established a Board of Schools of Medical Technology, whose specific interest at the present time is a study of the status of training of medical technologists in the Approved Schools of Medical Technology. This Board is made up of six members of the American Society of Clinical Pathologists, six pathologists who are vitally interested in better training for medical technologists. The members of the Board are: Ralph Miller, M.D., Hanover, New Hampshire; Melvin Oosting, M.D., Dayton, Ohio; F. C. Coleman, M.D., Des Moines, Iowa; Emma S. Moss, M.D., New Orleans, Louisiana; Otto Saphir, M.D., Chicago, Illinois; and O. O. Christianson, M.D., Spokane, Washington. The Board of Schools of Medical Technology works in cooperation with the Council on Medical Education and Hospitals of the American Medical Association, the American Society of Clinical Pathologists, and the Board of Registry. If any of you have problems about the approved schools, I am sure that this new Board would welcome your discussion of those problems, as it is the desire of the Board to do all it can to improve the training of medical technologists. Since 58.8 per cent of the medical technologists working in the Approved School laboratories are registered, it is reasonable to assume that a number of you can be of great assistance to the Board of Schools of Medical Technology.

Examinations in Medical Technology

For the last few years the number of candidates examined for certification in medical technology has steadily increased. There, again, when we examine the figures and seek an explanation of this increase, we must draw the conclusion that it is due to two things; first, that there are many more Approved Schools, and second, that young people are becoming interested in and aware of the need for adequate training in this profession. Also, there are many young men and women who became interested in medical technology during their service in the armed forces, and many of these young people have met the Registry requirements and have become registered.

In Table V you will see that during 1949 we certified 1,657 medical technologists. This is 249 more than the previous year, and 497 more than we certified in 1947. A total of 717 candidates took the recent examination on May 12, 1950, out of which number 567 made passing grades and have been certified.

Table V

1949 EXAMINATIONS FOR MEDICAL TECHNOLOGISTS

	Spring	Fall
Scheduled	732	1,367
Taking	703	1,337
Failing	131	251
Passing	571	1,086
Total certified 1949		1,657

Committee on Recruitment and Publicity

During the course of this report I have spoken several times of the fact that the work in the Registry office has been increased due to the fact that a good job is being done in publicizing the field of medical technology, with particular emphasis on the requirements for certification by the Board of Registry. I have indicated that although everyone is doing such a fine job, work in that direction is never completed. With that in mind, at its meeting last October the Board of Registry formed a committee, headed by Doctor Frank Queen from the Board, and Miss Ruth Feucht from your Society, to administer a fund of $2,000.00 allocated by the Board for the purpose of publicizing the profession and recruiting students. This committee has been active during the months since it was set up, in putting in motion various projects which will accomplish the purpose for which it was formed. The committee has worked with local and state groups of medical technologists and pathologists, has prepared material for use in career conferences, and in the short time that it has been responsible for this program, has made an excellent start toward even better projects for the future. Work of this sort must be done outside of regular working hours, and often it is a real sacrifice of one's personal time to carry on such a program. All of you who have so willingly sacrificed many of your off-duty hours in order to promote the best interests of your profession, are to be commended, and I know that in the end you will feel a great satisfaction in having had a part in such a program. Very recently I had a letter from one of your past presidents, who said that during the last year she had visited 14 High Schools, talked to 675 girls, granted 129 personal interviews, and, in the course of carrying out her program of recruitment and guidance, had driven 1,550 miles. I am certain that few of us can match this excellent performance, but certainly with the concerted efforts of hundreds of you who find it possible to make this kind of a contribution, there can be no doubt that in time all young people will be able to get correct information about the profession of medical technology, and will be guided in their efforts to obtain the best possible training.

You have shown by your attendance at your annual meeting that you realize the value of a strong national organization. The

increased growth of your Society goes along with the increased growth of registration, numbers of Approved Schools, and students in those schools. You have realized that good medical technology is a necessary and fundamental part of the vast nationwide mechanism of medical care for the American people. Only by the recognition of the importance of your profession, can you grow in professional stature and in scientific excellence, and that growth can only occur at its best when every single individual medical technologist realizes and accepts his responsibilities to his profession and to the American people that he serves.

ABSTRACTS

IDENTIFICATION OF ESTROGENS BY PAPER CHROMATOGRAPHY by Erich Heftman, National Cancer Institute, Bethesda, Maryland. Science 111; 571 (May 26), 1950.

This article is recommended for study by chemistry technologists who are interested in the various technical methods that can be used in estrogen chemistry. In that the reviewer feels that the technic given is still in the experimental stage and far from perfection the method is not abstracted.

THE PRESERVATION OF SHEEP CELLS FOR HETEROPHILE ANTIBODY DETERMINATIONS by Alfred S. Evans, M.D., Section of Preventive Medicine, Yale University School of Medicine. Jour. of Lab. and Clin. Med., 35; 300 (Feb. 1950).

Freshly drawn sheep's blood was preserved in 10 ml aliquots as follows: glass bead defibrination; 2 mg heparin; 2 ml of 5% sodium citrate; and 10 ml of Alsever's solution. At weekly intervals 2 ml of the various samples were withdrawn, washed three times with saline and then made into a 1% solution. All standardizations were tested against a serum having a titer of 1:640. for sheep cells.

In the hands of this author, sodium citrate appears to be a somewhat better agent for the preservation of sheep red blood cells for use in heterophile antibody tests than heparin, Alsever's solution, or defibrinated blood. After ten weeks storage no variation was found in the titer of standard serum with the stored cells when they were tested against fresh cells. Hemolysis does not necessarily make unwashed sheep cells unsatisfactory for heterophile agglutination tests.

FILTER PAPER MICROSCOPIC TEST FOR SYPHILLIS or the F. P. M. Test. A preliminary report. By Ralph B. Hogan, Senior Surgeon, and Shirley Busch, Bacteriologist, United States Public Health Service. Jour. Ven. Dis. Infor. 31:37 (Feb. 1950).

Dried blood and the V.R.L.D. antigen are used in this test. Capillary blood obtained by the usual methods is absorbed on #613 Eaton and Dikeman filter paper which has been cut into strips 3/8 by 7 inches. The reagents and the apparatus are essentially the same as for the V.R.L.D. test.

Considerable technical skill is required in performing the test; therefore, it is not to be recommended for office and small clinic practice. Its future and use lie in the fact that there is considerable promise for it to be perfected for large surveys, and that it will offer serology to congenital syphilitics during the first year of life.

This test is one for all medical technologists doing serology to follow, for it is quite likely that this test will become a standard hospital procedure for the new-born infant nursery, pediatric ward and clinics, and even in school surveys. It is definitely a test of the future.

At the present it is still in the experimental stage; its accuracy is not comparable to the standard tests according to the authors.

BOOK REVIEWS

CLINICAL LABORATORY PROCEDURES. A manual. By Alice A. Thorngate, A.B., Instructor in Clinical Pathology, University of Wisconsin. Spiral Paper Bound. First edition. 141 pages. Dubuque, Wm. C. Brown and Company. $3.00.

This manual gives the methods used at the State of Wisconsin General Hospital. This timely little volume is certainly most welcomed in that the University of Wisconsin is among the few large universities giving a standard four-year course in medical technology, and since these methods are part of the training course there, all teachers should find much worth while material.

On the whole the material is well presented, nevertheless, the reviewer feels that more references should have been included. For instance Barker's modification of the Rountree, and Geraghty Phenolsulphonphthalein test is given as the recommended procedure—but the reference is not given. An interested student should desire to read WHY a newer method is superior to an older and long established method; also, a student should know that if there are more than one standard procedure, which one is preferable, most advantageous, and time-saving. Furthermore, it should be a physician's privilege to order any test in a laboratory which will give him the maximum amount of information about a patient, thus technologists should be so trained, to produce a reliable result of any acceptable laboratory procedure.

Ear-lobe blood is sanctioned. The reviewer wishes to call attention to page 239 in the second edition of Wintrobe's Clinical Hematology to quote: "Blood from the ear lobe has been found to contain significantly more hemoglobin than venous or finger-tip blood." The reviewer wishes to affirm this statement and to add that when she has had to correct reports of other technicians and laboratories, that the sample used for the count was obtained from the ear-lobe in practically all instances. Ear-lobe blood should be used only for the Duke Bleeding time and the capillary tube method for coagulation. In all likelihood it is a typographical error that 2000 rpm is given instead of 3000 rpm for the Wintrobe hematocrit. Nevertheless, this is an error and one that should be corrected in all future editions. No description is made of the pathological blood cells.

The section on bacteriology is the highlight of the manual. The material is well compiled and the organization is excellent. As for chemistry, it is just routine, not as inclusive as one would hope for.

All schools of medical technology should have this manual at hand. In the opinion of the reviewer it represents a minimum of what should be taught rather than a maximum. Certainly it is to be hoped that this is the beginning of a series of manuals from many of our standard universities, and that not too long in the distant future we shall find more standardization in the training of medical technologists.

THE 1949 YEAR BOOK OF PATHOLOGY AND CLINICAL PATHOLOGY (January-December), edited by Howard T. Karsner, M.D., LL.D., Medical Research Advisor, Bureau of Medicine and Surgery, United States Navy; former professor of Pathology, Western Reserve University, Cleveland, and CLINICAL PATHOLOGY, edited by Arthur Hawley Sanford, M.D., professor of Clinical Pathology, University of Minnesota (The Mayo Foundation); Emeritus Consultant, Division of Clinical Laboratories, Mayo Clinic. 161 figures, 543 pages. Chicago. The Year Book Publishers, Inc., 1949. Price $4.75.

Although this series of books is written for the clinical pathologist in hospitals, there is much timely information included which is of particular interest to medical technologists. Dr. Sanford, the co-author, needs no introduction to technicians, as he ranks along with Stitt as one of the founders of laboratory medical procedures. Those methods, which in the opinion of this author, that are a definite contribution to clinical diagnosis and which have appeared during the current past twelve calendar months, are presented in abstracted form, and are accompanied by the proper reference to the literature.

During the past year renewed interest in the coagulation problem has brought forth a wealth of literature on this subject, and those reports which seem worthy of consideration have been reviewed and abstracted for this volume. Of especial interest to technicians is an article dealing with the effect of blood glucose concentration on alkaline hematin hemoglobin determination. Since the abstract is from a foreign journal, it is excellent to have the reference at hand. Red cell fragility is likewise under attack; several new technics are included among the abstracts.

The sections on chemistry and bacteriology, serology and mycology contain many excellent references on a great many diversified subjects. Recent advances in cytology, endocrinology, and apparatus are also included in this timely volume.

Any medical technologist who wants to know what are the current trends in medical technology should not feel that $4.75 is prohibitive for such a book. All schools of medical technology should have this authoritative volume as a reference.

HEMOLYTIC DISEASE OF THE NEWBORN by M. M. Picklew, D. M. Nuffield, Graduate Assistant in Clinical Pathology, Radcliffe Infirmary, Oxford. 181 pages, 19 tables, 21 figures. Springfield. Charles C. Thomas, 1949. Price $4.50.

This little volume was prepared by a physician for physicians and yet, three of the chapters contain information which should be a part of every medical technologists training. This book is among those which make good collateral reading. Although typically English in style and thought, the American literature has been reviewed and included, therefore making this volume a classic in English. The author has not only reviewed the literature in a most scholarly manner, but she has seen over 100 cases of the disease in the acute phase of the disease. Those technical methods which proved reliable are set out in the appendix.

The reviewer recommends that those who are interested in the Rh problem should read chapters 2, 3, and 4 in this book. This book should find a place in every hospital library.

NEW CATALOGUES

Arthur H. Thomas Co.

The 1950 catalogue of the Arthur H. Thomas Company, of Philadelphia, is now being distributed. This edition contains 1472 pages and lists 15,342 Apparatus items with 5401 illustrations, and 2570 Reagent items in 6289 packages, all selected primarily for use in laboratories of Chemistry and Biology. A comprehensive index of 62 pages is included. The book is printed on coated paper, bound in pyroxylin impregnated buckram and stamped with gold leaf.

The catalogue is based entirely on items carried in stock for immediate shipment, which indicates a policy of careful selection and, should assure the user of a prompt and dependable source of supply.

Many complete assemblies for specific tests are offered, particularly in the listing of equipment for use in Microchemistry, to which field the catalogue devotes considerable space. These assemblies are itemized so that variations to suit individual requirements can be ordered with ease.

Practical Air Delivery service is strikingly emphasized in the preface by a colored map which shows all present Air Express routes and airport cities in the U. S. and calls attention to the fact that air transport now blankets the country with overnight service.

The excellent illustrations, convenient typographical arrangement, detailed descriptions with dimensions, etc., and numerous references to the literature, result in a volume which is more than a trade catalogue. It is a worthy successor to its predecessors and scientists will find it invaluable as a reference book.

WILL CORPORATION

Will Corporation, Rochester, N. Y., distributor of laboratory equipment and supplies, have announced the publication of their completely new Catalog 6. The book contains more than 12,000 items and sizes on 902 pages and with 3500 wood engravings.

Descriptions are factual and complete. Obsolete items have been eliminated and more than 2500 new ones added. Arrangement is alphabetical with running headline on every page. Particular stress is laid on readability and ease in locating any wanted item. Prices are current. Anyone interested in securing a copy is invited to write, on his business letterhead, to Will Corporation, Dept MT, Rochester 3, New York.

EDITORIAL

Excerpta Medica

The American Journal of Medical Technology wishes to call the attention of its readers to **Excerpta Medica.** This is a monthly abstracting service with a world wide scope which is published in Amsterdam. It is distributed in more than sixty countries throughout the world. It is published in fifteen sections covering all phases of clinical and experimental medicine.

The organization is under the general editorship of M. W. Woerdeman, professor of anatomy and embryology at the University of Amsterdam.

Excerpta Medica is published on a non-profit basis; its sole income is through subscriptions. It has been operating at a loss, and its continuation would not have been possible had it not been subsidized by the government of the Netherlands.

Excerpta Medica deserves the support of every one interested in medicine. There is a section which corresponds to clinical pathology, and hence all medical technologists might well be interested. It has the approbation of every important medical journal in this country as well as in foreign countries.

In the United States it is distributed by The Williams and Wilkins Co., Mt. Royal and Guilford Avenues, Baltimore 2, Maryland.

A. H. B.

EDITORIAL

We wish to thank the members of the American Society of Medical Technologists for so graciously including us in their many activities at the recent meeting in Houston. Each year we attend the Society meetings, we have such an enjoyable time, and renew so many old acquaintances and make so many new ones, that we look forward with pleasant anticipation to the next meeting. The Society is to be congratulated for the excellence of the program, and for the many new features that added so much to it. We hope that by being there we were able to contribute in a small way to the fine job that is being done by the Society members toward solving some of our mutual problems.

Sincerely,
Lall G. Montgomery, M.D.
Chairman, Board of Registry of
Medical Technologists
Ruth Drummond, Registrar

ARMY HEPATIC AND METABOLIC CENTER TO MOVE TO WALTER REED HOSPITAL

The Army Hepatic and Metabolic Center, which carries on the Army's fight against infectious hepatitis, will be transferred from Valley Forge General Hospital, Phoenixville, Pa., to Walter Reed General Hospital, Washington, D. C., June 15, according to Major General R. W. Bliss, Army Surgeon General.

The function of the center is to gain more information in the recognition and treatment of infectious hepatitis, and research in the study of liver. As yet no specific treatment has been discovered, although the illness is curable by bed rest and a highly nutritious diet.

Hepatitis involved an estimated 55,000 military personnel in all theaters during World War II. It is known that the virus of infectious hepatitis is transmitted in the same way as water-borne diseases such as typhoid and intestinal fevers. However, the exact mode by which the virus is transmitted from man to man is not fully understood. Part of this lack of information is because no experimental animal susceptible to the disease can be found.

Research Director of the Center is Dr. Victor M. Sborov, instructor in

medicine at the University of Pennsylvania, research associate in medicine for the Jefferson Medical College, Philadelphia, Pa., and a member of the Association for the Study of Liver Diseases. First Lieutenant Donald A. Sutherland, Army Medical Corps, is Assistant Clinical Director.

The Hepatic and Metabolic Center, established in the fall of 1948, is closely associated with the Army's Commission on Liver Diseases. Dr. Cecil J. Watson, professor of medicine at the University of Minnesota, is chairman of the Commission.

The Center was recently approved for training by the American Board of Internal Medicine; and thus far, two physicians from the University of Pennsylvania, and one from the Jefferson Medical College have been selected for training at the unit. A complementary unit exists at the 98th general hospital in Munich, Germany. Here acute cases of hepatitis and liver dysfunction, as well as field problems of epidemiology and the evaluation of new preventive and curative drugs are studied.

An exhibit, "The Liver Biopsy as a Useful Adjunct in Chronic Liver Disease," will be displayed at the Scientific Section of the American Medical Association convention in San Francisco June 26-30. Both Dr. Sborov and Lt. Sutherland, who collaborated in designing the exhibit, will be in charge.

WANTED

Do you care to sell any of your old numbers of the AMERICAN JOURNAL OF MEDICAL TECHNOLOGY, or its predecessor, THE BULLETIN OF THE AMERICAN SOCIETY OF CLINICAL LABORATORY TECHNICIANS? We need IMMEDIATELY copies of the first issue, the yellow "Bulletin" for November 1934, which was Volume I, Number 1, and May 1937, Volume III, Number 3. The Journal will pay one dollar for each of these scarce issues.

ARMY TESTING NEW VACCINE AGAINST SCRUB TYPHUS

An iced vacuum jug containing 20 cubic centimeters of a new type of scrub typhus vaccine has been sent to Kuala Lumpur, Malaya, for testing by an Army Medical Department team against the disease which in some areas hampered war time operations of allied troops more than the Japanese, Army Surgeon General Raymond W. Bliss announced today.

Tests will be carried on to determine the effectiveness of the unnamed vaccine against typhoid fever as well as scrub typhus. The investigations are to be conducted at the site of the Army's first successful application of chloramphenicol (chloromycetin).* Continuing studies are being made also to determine an optimum dosage and time schedule for the administration of synthetic chloramphenicol.

Army personnel working on the Malayan field test include Major Robert Traub, MSC, of 1207 North Pitt Street, Alexandria, Virginia; Captain Herbert Ley, Jr., MC, of 2220 Washington Avenue, Silver Spring, Maryland; Captain Lyman P. Frick, MSC, of 514 Domer Avenue, Takoma Park, Maryland; First Lieutenant Fred Diercks, MSC, of 7029 Strathmore Street, Chevy Chase, Maryland, and First Lieutenant Vernon Tipton, MSC, of 410 South Olive Drive, Mesa, Arizona. All are assigned to the Army Medical Center, Washington, D. C.

The team is informing Dr. Joseph Smadel, director of the Virus and Rickettsial Department of the Medical Department Research and Graduate School at the Army Medical Center of developments. Dr. Smadel led the team which conducted the original testing of chloramphenicol in 1948.

Although typhoid fever is of more concern to the United States than scrub typhus, the latter disease assumes great significance when American troops operate in or occupy areas where the disease is prevalent. It is an important health problem in Japan and other parts of the far west Pacific

areas. No satisfactory way of combating the disease was discovered until chloramphenicol, an antibiotic derived from a mold, was first produced in the laboratories of a pharmaceutical firm and tested by the Army Medical Department.

Carrying a small supply of the then-rare "wonder drug," Dr. Smadel's team landed at Kuala Lumpur on March 15, 1948, and began the test the same day. Administered to a soldier of one of the British Malay regiments, the antibiotic was found to be highly effective. Within 20 hours, fever and most of the other signs of scrub typhus had disappeared. In case after case, the drug proved its worth.

The Army Medical Center's Virus and Rickettsial Department, one of the largest research institutes in this field in the world, began a series of studies on other uses for the drug. So far, it has been found to be effective not only against the organism of scrub typhus, epidemic typhus and typhoid, but also against the rickettsial agents of murine typhus, spotted fever, rickettsialpox, Q fever, and psittacosis.

* * *

*NOTE: Fact Sheet on "Chloromycetin: The Role of the Army Medical Department in its Uses in Rickettsial Diseases and Typhoid Fever" (dated for release March 27, 1949) is available on request from this office, Room 1743, Main Navy Building, Washington, D. C.

LOST YOUR MICROSCOPE?

CHICAGO—Lost your microscope? Was it stolen?

Report it to SAMA.

SAMA is the Scientific Apparatus Makers Association, located at 20 North Wacker Drive, Chicago. It has maintained its "File of Stolen Microscopes" as a public service since the Association was formed in 1918.

Owners—professional and amateur scientists, students, and craftsmen—report first to their police department then to SAMA immediately a microscope is stolen. They give make of the instrument, serial number and other identifying numbers or marks, time and circumstances of theft, and any other information that may be pertinent.

SAMA, the trade association of the scientific instrument and laboratory apparatus industry in America, has constant contact with practically all corporations, firms, and individuals who deal in any way with scientific instruments. When a used instrument is brought in for sale (or perhaps for pawn), the dealer reports make, serial number and circumstances to his local police, then to SAMA.

Periodically SAMA sends out to police departments, repair and service shops, pawn shops, etc., a list and details of the most recent thefts.

Details of instruments reported to SAMA by repair or service shops, police, pawn shops and numerous other sources, are checked against the cards in the "File of Stolen Microscopes." Sometimes the details match.

When SAMA discovers a stolen microscope it informs the original owner and considers its work done. The owner then may report the discovery to the police for necessary action.

"It is impossible to tell how many stolen microscopes are recovered," Kenneth Andersen, executive vice president of SAMA, said. "We have no way of knowing how often a police department may find a stolen instrument, check it against the list sent to the department by SAMA, then notify the owner directly. But we do know that that happens often."

Andersen said approximately 100-150 instruments are reported stolen each year. Cards remain in the file until SAMA is notified that the instrument has been discovered. At present there are more than 1,000 cards on file, but many of these instruments may have been found and SAMA not notified, he said.

Some cards date back as far as 1935. Most, however, carry dates less than three years old.

A NOTE FROM THE MINUTES OF THE AMERICAN SOCIETY OF CLINICAL LABORATORY TECHNICIANS OF JUNE 11, 1934

is to the effect that:

"The Registry be petitioned to appoint a committee on education whose duties shall be to limit the number of technicians being trained in approved training schools. We are being swamped with too many technicians, both the qualified kind and the $6.00 a week, 6 weeks course kind." And this was just 16 short years ago—well within the ken many of us—no doubt even the youngest member of A.S.M.T. was at least in kindergarten.

1950 CONVENTION HIGHLIGHTS

Total registration: 612 (possible attendance 650). Forty states, Hawaii and Guatemala were represented by 409 members. Thirty more of the visiting laboratory workers are eligible for membership. Fifty Sisters, representing 18 state societies, were present.

Movies were made throughout the convention and will be available upon request after December 1, through the Executive Office. A small deposit will be required. The movie will possibly be made a part of the exhibit. (Please book exhibit and movie early.)

Convention awards were as follows: (for papers) First—Sister M. Simeonette (Savage), Louisville, Ky., and Sister John Emily (Maginnis), Lexington, Ky.: "Sodium Metabolism in Health and Disease and a Photolometric Method for Its Determination in Biological Fluids." Second —"The Value of Photomicrography in Color in the Study of Hematology," by Sister M. Leo Rita (Volk), St. Louis, Mo. Third—"The Medical Technologist Looks at Tuberculosis," by Anne B. Maddocks, Columbus, Ohio. The Registry Award went to Marshall L. Snyder, Ph.D., Dorothy Donnelly, and Mary Nix, Portland, Oregon, for their paper on "Some Practical Applications of Impregnated, Dried Paper Discs Containing Various Reagents for the Cultural Differentiation of Bacteria." The paper on "A Suggested Method for the Detection of the Diabetic and Pre-Diabetic" by Mrs. Doris Wallace, Houston, Texas, received Honorable Mention for this Award. The Hillkowitz Memorial Award was presented to Margaret Krepsky, Wauwatosa, Wisconsin, for her paper on "The Impedence Angle and Thyroid Dysfunction." Sister M. Leo Rita also received the individual award for her exhibit on "The Proposed Classification of Blood Cells." The Kentucky Society received the award for the best state exhibit.

We wish that every one of the 4400 plus members of the American Society of Medical Technologists had been able to come to Houston for the convention. If we told you about it in the detail we would like, we would be accused of a big Texas Brag. Suffice it to say that every minute from the opening moments of the Advisory Council meeting on Sunday afternoon, through the sightseeing tour and reception that day, the opening and scientific session on Monday morning, the exhibits, the trip to San Jacinto, with its visit to the Battleship Texas, and a seafood dinner, the papers and exhibits on Tuesday, with the rodeo and a real barbecue dinner afterwards, on a genuine "working" ranch, the House of Delegates Meeting on Wednesday (report on this session will be in a later issue of the Journal), with the extra treat of a talk on their techniques, by Milton Wigod of the Ortho Research Foundation, kept everyone busy. An extra session of the Public Relations Workshop was held on Wednesday evening by special (and popular) request. The Minnesota film on "Training Medical Technologists" was shown at this session. The Workshops proved a success, and made such programs mandatory for the future. Resumés of these will also be found in future issues of the Journal. The annual banquet with its tradition roll call of the states and awarding of prizes, together with a word of greeting from Dr. F. J. L. Blasingame, of

Wharton, Texas, as an official representative of the A.M.A., was a fitting close for a "most successful convention."

NOW—TO LOOK AHEAD TO 1951

The Program Committee for 1951 is very anxious to have speakers and subjects the members would like to hear when they come to Boston. It isn't too early to start planning so any and all suggestions will be very welcome. Please send them to the Program Committee Chairman,

Helen J. Madden, MT (ASCP)
86 Jersey St.
Boston, Massachusetts.

And start thinking about your exhibit for 1951 NOW! A later issue of the Journal will give you the information about whom to contact.

ANNUAL REPORT FISCAL YEAR 1949-50
FINANCE COMMITTEE

The Committee activities consisted of:

1. For final division of the budget appropriation—Committee Fund, the submitted estimated costs for projects of the Committees were reviewed. An allotment for each standing committee was approved and in addition, for the Public Relations, Special Committee allocation.
2. Authorization of a $200.00 disbursement for necessary expenses incurred by representatives attending the annual meeting of the Board of Registry, ASCP.
3. Requested Committee opinion was given on the estimate of needed equipment and request for an additional monthly allowance for extra help and miscellaneous expenses for the Executive Office.
4. For budget 1950-51 consideration, the Committee was notified of a request for possibly $1,000.00 toward production of a film on medical technology—to be used in recruitment programs.
5. With study and consideration of the various budget items in conjunction with the membership record and requested and furnished data on the JOURNAL account, proposed JOURNAL budget, and recommendations regarding personnel (Executive Office) and salaries, the Committee's proposed budget appropriation for 1950-51 are based on estimated income of $21,800.00 or 4360 members.

Committee recommendations directed to the Board of Directors were:

a. Stamp fund for Committee work which had been handled by the Executive Office be discontinued and that each Committee Chairman buy stamps and submit a bill for same, the cost of stamps to be deducted from the fund allotted that Committee.
b. For distribution of the Convention Travel Expenses, require each officer and Board Member to notify the Treasurer at least thirty days prior to Convention time, of his or her intent. By so doing the full appropriation for this purpose can be proportionally disbursed to those able to attend.

Committee Chairman offered:

a. To have a Roster printing in January, 1951, provided the paid membership is 4500 and with Board sanction at that time.
b. To authorize the transfer of certain funds for routine expenditures to the Executive Office account at quarterly or semi-annual periods and require quarterly reports on the disbursement of such funds for the Board of Directors.

Finance Committee, 1949-50
Mary F. Eichman, Chairman

STANDARDS AND STUDIES

The Standard and Studies Committee reports that upon request of the committee the Women's Bureau of the Department of Labor has consented to conduct a survey of the medical technologist. This will be a saving of money and labor for the ASMT.

During the year the committee members have endeavored to raise the standards, and to enlighten the public, the students, the various societies of the true facts of the Medical Technologist. Talks to schools, clubs, societies, and letters to individuals.

Information derived from the replies:

Number of Questionnaires sent out	17,080	
Number of Questionnaires received	16,672	
Hospitals that required technicians to be registered		7%
Clinics and Doctor's offices to be registered		83%
States that require state licensure		2
Organized Unions—Medical Technicians—Hospital		2
Number hospitals training technicians		67
Number students training		1,234
Full-time employed technicians		16,354
Part-time technicians		571
Jobs need technicians		2,473
Working hours:		
40 hours		65%
44 hours		26%
48 hours		.09%
Over 48 hours		.001%
Overtime:		
Night call		11%
Split shift		5%
Alternating		4%
Not on call		89%
Maintenance:		
Room		3%
Medical care		78%
Uniforms laundry		92%
Pay for overtime		6.5%
Salaries:		
Lowest average		$219.00
Average average		294.00
Highest average		356.00
Reasons for leaving jobs:		
Better pay		52%
Marriage		39%
Attend school		2%
Family ties		3%
Illness		1%
Discharged		2%
Reasons not given		1%
Members of C. I. O.		18
Members of A. F. L.		35
Technicians from approved schools **not** registered		667

The other percentages of the previous report practically the same—not worth commenting on the percent changes.

Mollie L. Hill, Chairman
Standards and Studies Committee

Membership—1949-1950

At the beginning of the fiscal year ASMT had **3735** members in good standing. It was decided that during the first quarter of the fiscal year our committee would concentrate on contacting the May, 1949 new registrants and also try to reach each of the persons who had once been ASMT members to try to find out why they had dropped their membership. The country was divided into five regions (Hawaii, Puerto Rico, Alaska, and Canada along with our foreign members made up the sixth region. One member of the committee was assigned as regional counsellor for each group of states and the chairman took care of the territorial and foreign members.) The regional counsellors in turn contacted the respective state membership committee chairmen in their states and sent them copies of mimeographed letters to be used in contacting new registrants and delinquents, stamps, envelopes, and other supplies. Each state was also asked to write another letter on their stationery and enclose it with the one from ASMT.

The cooperation from the states and the regional counsellors was excellent, and I cannot express how much thanks my committee owes to the Executive Secretary and her staff, for after our committee had once contacted the delinquent members, the Executive Office followed up with the second and third letters. By January 16th the delinquent members of 1949-50 who had failed to renew their membership by November 15th had been reduced to a total of **582.** By February 3, 1950, this total had been reduced to **438** and at the present time the figure is **380.** There have been **102** resignations. One of these has been reinstated.

The second quarter the committee concentrated on the new registrants again and started working on the old registrants who had never joined ASMT at any time. Mrs. Drummond from the Board of Registry very kindly made a separate list of registrants in good standing for the use of each of our state groups and also sent us lists of the May and October, 1949 new registrants. We wish to express our thanks to the Board of Registry Office for this fine cooperation.

By December 31, 1949, we had **568** new members and **2865** old members paid and in good standing. A total of **3463.**

The third quarter we continued, with the help of the states, contacting old registrants and contacting the new ones from the October, 1949 examination. Several of the states put on special projects to increase their membership. Pennsylvania sent out letters to the over 700 registrants in their state. Minnesota got out a special issue of their Journal which went to every registrant in the state regardless of whether they were ASMT or Minnesota members. Massachusetts also contacted every registrant in their state that was not yet a member of ASMT and the Massachusetts Society. Postage, extra costs for mimeographing and printing, etc. for these special projects were paid by the Membership Committee funds. Trips to visit the state groups in Iowa, Montana, and North Dakota in the interest of membership were made by the chairman. Miss Reilly visited and spoke at the seminar put on by the Massachusetts Society to which were invited registrants from all the New England States. Miss Maxson also visited these state groups in her region in the interest of membership. Miss Johnson, President-Elect, spoke on membership to the Missouri Society at their seminar. Mrs. McIntyre, regional counsellor for the Northwestern states made several trips in her region, notably to Montana, Washington State and Idaho. Transportation expenses for these trips in the interest of membership were paid by ASMT with the inviting state taking care of the local expenses. Several trips were made by the committee members and the state membership chairmen at their own expense in the interest of increasing membership.

The fourth quarter we tried to finish the work we had started during the year and especially tried to encourage the states to increase their mem-

bership by April 30th so that each of them might have an extra delegate this year. Several were able to do this. In this connection the Membership Committee has a recommendation it would like the House of Delegates to consider for next year. Namely, increasing the number of maximum delegates allowed to each state. As you all are aware, the Constitution now says that any state can only have a maximum of 10 delegates. Two states have already reached this maximum and three more have almost done so. Since each delegate is supposed to represent 25 of our members, it seems unfair to us that the larger states be penalized in this manner. It also gives them no incentive to try for added members after they reach 226 members. Several of our states have a potential membership of well over 500 mem-

STATE	Paid 1949-50 Old Members	Paid 1949-50 New Members	Total Members 1949-50	Reg. MT (ASCP)	Total 1949-50 Not Paid	Resigned 1949-50
Alabama	51	23	74	198	8	1
Arizona	21	2	23	82	1	0
Arkansas	49	11	60	118	5	0
California	145	24	169	923	30	7
Colorado	117	20	137	344	13	2
Connecticut	23	8	31	150	9	0
Delaware	6	3	9	30	3	0
District of Columbia	29	11	40*	129	5	0
Florida	71	15	86	265	11	0
Georgia	56	39	95	228	7	0
Idaho	17	7	24	54	1	0
Illinois	213	88	301	753	16	8
Indiana	82	9	91	321	7	3
Iowa	41	17	58	178	8	2
Kansas	78	32	110	323	4	3
Kentucky	75	43	118*	380	7	4
Louisiana	66	39	105	314	9	0
Maine	13	0	13	68	2	0
Maryland	47	14	61*	175	8	0
Massachusetts	83	28	111	312	4	3
Michigan	128	39	167	691	23	4
Minnesota	153	57	210	517	7	13
Mississippi	42	12	54	123	1	1
Missouri	140	31	171	476	22	0
Montana	18	8	26	129	5	0
Nebraska	57	20	71	160	4	2
Nevada	3	1	4	21	0	0
New Hampshire	17	3	20	61	1	1
New Jersey	72	10	82	272	6	0
New Mexico	23	2	25	50	3	1
New York	156	33	189	714	4	7
North Carolina	40	16	56	232	7	0
North Dakota	18	6	24	59	1	0
Ohio	141	92	233*	724	7	5
Oklahoma	87	18	105	194	9	2
Oregon	60	39	99	241	5	0
Pennsylvania	186	50	236	804	13	7
Rhode Island	10	0	10	27	0	1
South Carolina	11	1	12	94	3	1
South Dakota	25	9	34	58	2	0
Tennessee	50	14	64	233	4	13
Texas	246	82	328	792	25	3
Utah	13	10	23	62	1	0
Vermont	7	6	13	27	2	0
Virginia	85	11	96*	353	12	2
Washington	29	23	52	309	19	0
West Virginia	28	6	34	116	4	0
Wisconsin	135	38	173	452	21	3
Wyoming	15	0	15	28	2	0
Hawaii	17	13	30	50	1	0
Other Ter. and Foreign	52	15	56	318	7	2
Total	3341	1098	4439	13731	379	101

* According to Address.

bers so we are suggesting that this matter be discussed and a change made in our Constitution through the proper channels.

During the year we have had three states, Idaho, the Territory of Hawaii, and Iowa, complete their affiliation; and two states, Nevada and Rhode Island have applied for affiliation. We hope to have these all affiliated by July 1, 1950. Maine and Arizona have made a start toward forming state groups for the purpose of affiliation. This leaves South Carolina the only state which has not yet begun to organize.

As of the present time, ASMT has **4462** members in good standing; **1118** of whom are new members as of this fiscal year.

The Committee would like to make the following recommendations for the coming year:

1. Send Information Pamphlets to members whose cards were returned as a result of those sent out with our renewals in January, 1948 in order that these people might be contacted. Since August 15, 1949, these cards have been checked and all who are already members of ASMT have been eliminated, leaving:
   a. Those that think they belong to ASMT but still do not realize the difference between the SOCIETY and the REGISTRY.
   b. People who have requested information and application blanks on ASMT.
2. Contact through the state groups (the Executive Office has checked these people also with the Registry lists) those people who applied for membership three or more years ago and who paid $1.00 application fee (you will remember at that time our dues were $4.00 with a $1.00 application fee) but whose membership has never been completed.
3. Ask the states to continue checking their lists of registrants to see if any have left the state, lost addresses, changed names, etc. This can be done so much better by the states than by the Executive Office.
4. Make sure that those eligible in your states for membership through the Master's Clause are invited to join ASMT and your state society.

As Chairman, I wish to thank all of you who have so generously given of your time this past year to promote our membership campaign: to Mrs. Drummond of the Registry, the Executive Secretary, the Board of Directors of ASMT, members of my committee, the state membership chairman and just members of ASMT who have made it their business to promote ASMT.

Our goal for 1950-51—50 AFFILIATED SOCIETIES, 6000 MEMBERS.

Ida Lucille Wallace, Chairman
Membership Committee

LEGISLATION

The Committee on Legislation had as our aim for the year's work a two-fold goal. We wished first to assemble complete information on the incorporation status of each state society and learn the measure of protection attained by each such incorporation process; in those states not yet incorporated, we wished to learn why they were not and to lend aid toward their becoming incorporated. Secondly, we wished to devise a list of possible and wise procedures which might help in preventing the passage of harmful legislation, and we wished to instigate such steps in all states.

For ease in contacting all states, we assigned each committee member eight states, in his own geographical sector where possible. An outline of the year's work was made and sent to each member of the committee; three dates were listed upon which progress reports were to be sent to the chairman for compiling and reporting to the Board of Directors. Attached hereto is a chart showing information obtained from the states; this chart is a resume of all data secured by the committee from its inception through May 15, 1950.

The suggested procedures for precautionary measures against adverse legislation follow:

1. Acquaint the state pathologists, through their organization and with the cooperation of the Registry Counselor for your area, of the always-possible threat of licensure being introduced in your state, and the consequences of the passage of such a bill. This, of course, implies that you first know and understand the problem under the guidance of your own state legislation committee.
2. With the backing of your pathologists, contact the state medical society; obtain their backing and seek the aid of their lobbyists in watching for possible introduction of legislation affecting our profession.
3. In your capitol city, have a standing committee, preferably composed of both technologists and pathologists, ready at any time to arrange and appear at a public hearing in case such a bill is introduced.
4. Have definite and crystalized plans for action in case the above measures are inadequate. These plans might include a substitute bill prepared for use as counter-legislation; they should include prompt contacting of your area Counselor, your Board of Registry, and your national committee at the first threat of such legislation.

As chairman for the past two years, I wish to thank the members of the committee for their excellent cooperation and many hours of work. We are also indebted to Dr. Lall G. Montgomery for his interest and cooperation and to Dr. Frank B. Queen of Portland, Oregon, who offered and gave us help and advice.

Vernal Johnson, MT (ASCP)
Chairman, Legislation Committee

Unincorporated Affiliated Societies

Society Name	Why Not Incorporated	REMARKS
California	Lack of funds for legal fee	Legislature meets biennially, next in 1951. State has licensure under state health dept.
Delaware	.....	Legislature meets biennially; next in Jan., 1952.
Idaho	Attempt in process now	.....
Missouri	Expected to receive final Articles in March, 1950	Missouri medical society is co-operating with their lobby
Massachusetts	New society	Fought a bill this year successfully, and feel that it may be re-introduced
Montana	Lack of funds	.....
Wyoming	Lack of funds	.....

* In the names, where the initials M.T. appear, the words are Medical Technologist; where the abbreviation Med Tech. or Clin. Lab. Tech appears, the words are medical or clinical laboratory technician.
† All incorporated societies are of the non-profit type

Incorporated Societies

SOCIETY NAME*	Incorporation Status†			Legislature	Licensure Present	Prospects
	Date	Duration	Terms			
Alabama State Soc. of M.T.'s	1949	.....	Name Prot.	Next in 1951	Non-enforced law. Bill offered in 1949 defeated	Reintroduction of 1949 bill; pathologists aiding
Colorado State Soc. of M.T.'s	9-28-48	.....	.....	Biennial Next in 1951	Two bills in committee defeated	State medical society co-operating
District of Columbia Soc. of M.T.'s	11-16-48	Perpetual	Name Prot.	Congressional Session	.....	.....
Florida Division of A.S.M.T.	5-27-48	Perpetual	.....	.....	Bill passed 1949	.....
Georgia Society of M.T.'s	8-30-49	35 years	Name Prot.	.....	No threat	Pathologists co-operating
Illinois Medical Tech. Assn.	3-29-49	Perpetual	Name Prot.	Next Jan., 1951	Preparing a counter bill	Society alert to legislators
Indiana Soc. of M.T.'s and Lab. Techs.	5-28-48	Perpetual	Name Prct.	Next Jan., 1951	.....	.....
Iowa Society of M.T.'s	10-11-48	50 years	Name Prot.	Next Jan., 1951	.....	.....
Kentucky Society of M.T.'s	7-18-40	.....	.....	.....	.....	State Health Dept. co-operating
Louisiana State Soc. of M.T.'s	1-12-45	Perpetual	.....	Next Jan., 1951	.....	Society is discussing
Maryland Society of M.T.'s	.....	.....	.....	.....	.....	.....
Michigan Society of M.T.'s	4-12-48	30 years	No Prot.	.....	.....	.....
Minnesota Society of M.T.'s	5-28-49	Perpetual	No Prot.	Next Jan., 1951	.....	Society is studying
Mississippi Soc. of M.T.'s	.....	.....	.....	.....	No known threat	Society is discussing
Nebraska Society of M.T.'s	7- 6-48	Perpetual	Name Prot.	Next Jan., 1951	Favor licensure	Society follows ASMT policy
New Hampshire Soc. of Lab. Techs. and M.T.'s	11-16-40	.....	.....	Next Jan., 1951	.....	Members are working through legislators
New Jersey Society of M.T.'s	.....	.....	.....	.....	.....	.....
New Mexico State Soc. of M.T.'s	6-17-48	50 years	Name Prot.	Biennial Next Jan., 1951	.....	.....
New York Empire State Assn. of M.T.'s	3-31-50	.....	.....	.....	Bill in hands of State Health Dept.	Active committe alert
North Dakota Soc. of M.T.'s	8- 6-49	Perpetual	No Prot.	Next Jan., 1951	.....	Society follows ASMT policy
Ohio Society of M.T.'s	7-14-48	Indefinite	No Prot.	Biennial Next Fall, 1951	.....	.....
Oklahoma Society of M.T.'s	3-14-40	Perpetual	Name Prot.	Biennial Next Jan., 1951	No known threat	Secured service of med. soc. lobby
Pennsylvania Soc. of M.T.'s	1940	Perpetual	Name Prot.	Biennial Next 1951	.....	Society follows ASMT policy
South Dakota Soc. of M.T.'s	4- 8-48	Perpetual	No Prot.	Next Jan., 1951	.....	.....
Tennessee Soc. of M.T.'s	.....	Perpetual	Name Prot.	Next Jan., 1951	Bill in last Leg. defeated	Pathologists co-operating; Society follows ASMT policy
Texas Society of M.T.'s	1933	.....	.....	Next ,1951	.....	.....
Utah Society of M.T.'s	1- 9-49	10 years	Name Prot.	Biennial Next Jan., 1951	.....	.....
Virginia Society of M.T.'s	10- -48	Perpetual	Is Prot.	Biennial Next Jan., 1952	.....	Society follows ASMT policy
Washington State Soc. of M.T.'s	3-30-48	Perpetual	Name Prot.	Biennial Next Jan., 1951	.....	.....
West Virginia State Soc. of M.T.'s	3-17-48	Perpetual	.....	Biennial Next Jan., 1951	.....	.....
Wisconsin Assn. of M.T.'s	2-28-50	Perpetual	Name Prot.	Next Jan., 1951	.....	Society follows ASMT policy

RESEARCH

For the past year the chief concern of the Research Committee has been the ways and means to stimulate interest in research among the members of ASMT. It is true that many of us are engaged in research in our daily work, but, if analyzed statistically, one would probably find the research technicians a small minority in our organization.

Unfortunately, the Committee's plan for obtaining research grants has been unsuccessful to date; however, valuable investigative work can be conducted in any hospital laboratory, and, in many instances, without highly specialized equipment. An excellent example of this statement is a group project conducted by the Colorado State Society several years ago. The members of that organization, in various localities, determined the loss of glucose from oxalated and heparinized blood on standing over a period of time, and under varying temperature conditions. The writer found the results of these experiments very interesting and most helpful.

The state organizations of ASMT should encourage group research projects whenever possible, as group projects are not only beneficial to the individual technician, but they also aid in maintaining the professional prestige of the American Society of Medical Technologists. The average qualified medical technician who strives for accuracy in the daily routine, observes and records results carefully, can contribute valuable information to others in the field of medical technology.

The writer feels it is important that the organization be kept informed of research publications submitted by members of ASMT, and suggests that the title, author, and journal of such publications be inserted in the American Journal of Medical Technology.

I would like to remind the members of ASMT that the technical services of the following Research Committee members are always available:

Mr. Elvyn Scott, Medical Bacteriology, Delaware Hospital, Wilmington 13, Delaware.
Miss Ruth Guy, Serology and Bacteriology, William Buchanan Blood Center, Baylor Hospital, Dallas 1, Texas.
Miss Dorothy J. Hitchcock, Parasitology, 158 Orchard Street, East Lansing, Michigan.
Mrs. Hazel Sussenguth, Serology, 1883 East 101st Street, Cleveland, Ohio.
Mr. Forrest Cross, Mycology, Division of Tuberculosis, Federal Security Agency, Washington 25, D. C.
Mr. Hartzell Payne, Bio-Chemistry, Department of Research, Commercial Solvents Corp., Terre Haute, Indiana.

Hartzell G. Payne
Chairman, Research Committee

EDUCATION

1. We have conducted the Hillkowitz Contest, sponsored by the Denver Chemical Company and Will Corporation, of which Miss Margaret Krepsky was the winner this year.
2. In 1949 we released to the organization Section 1 of the Hematological Study which is comprised of lantern slides, orginal blood smears and brochure of the pathological conditions of the red blood cells. This year we have been attempting to prepare Section 2, the white blood cells. It is nearly completed and will be released to the organization in the very near future. We have felt if the organization were acquainted with this project and realized its worth, there would be a greater demand for its use. We would like to take this opportunity to encourage you to review the material.
3. We have continued to carry on an extensive project in recruitment in getting material out to the various state educational chairmen and have sent various material to the committees regarding interesting college students in Medical Technology.
4. We have gathered information regarding refresher courses and have released information to persons requesting same.
5. We have continued to give information to the state organizations requesting help in putting on their state and local meetings, suggesting

speakers, material for educational viewpoint and films which we have attempted to keep up to date.

Sister Mary Antonia, Chairman
Education Committee

EXECUTIVE OFFICE

Besides the detailed duties concerned with current incoming dues and cases during the past months since the office was established in Houston, we have attempted to clear all cases which were pending when the office was moved. We have also sent out three sets of statements to state treasurers, including those for payment of 1950-51 dues, besides which we have sent out uncounted statements in individual cases as well as complete sets to such states as have requested them.

We have kept up with all address and name changes as they have been sent to us. Although there is not a great saving in expense due to our having our own facilities for making addressograph plates, we feel there is added efficiency in maintaining a current addressograph file. We have made over 3,000 new plates and address changes since we have had the graphotype.

Our file system is undergoing a complete revision. Hereafter we shall have a file folder for each member of ASMT as well as state and miscellaneous files. We hope, before another year passes, to have ready for immediate use, at any time, information on all phases of our organization policies, together with complete records of all activities.

The cooperation of the Registry office has resulted in our having a complete Master List of Registered Medical Technologists (ASCP) which we have completely up to date with their sending us all current changes of name and address. Another project for next year is to rearrange alphabetically and bring up to date our card file of registrants. This is arranged in numerical order at the present time, and so has a rather limited use. We also have another list of registrants which we have not yet had time to bring up to date. We are wondering if, after this has been corrected, each state would like to keep its own Registry list up to date from year to year. If we could depend upon the cooperation and dependability of at least one person in every state, we would take care of sending them the changes as we make them. This, of course, will not be an immediate procedure, but may be a possible plan for the future.

We have had the responsibility of distributing the Hematology Loan Sets which were in the Executive Office when it was moved from Lafayette, Louisiana. We understand the Education Committee is working on a more elaborate series of loan sets, with lantern slides as well as direct blood smears. As soon as we have more definite information regarding these, we shall publish the announcements in the JOURNAL.

This year we have mimeographed four Newsletters which were sent to the national and state Boards of Directors. In these we tried to remind the officers of the societies of such items of procedure as would facilitate their work and ours, and give them an idea of what we were doing, and how we could work more cooperatively together.

Quarterly reports were sent the Board of Directors from the Executive Office and the standing committees. We took care of all such mimeographing as we were requested to by the various committees, and assisted in the distribution, also as requested.

The mailing of packets of letterheads and envelopes, mimeographed material, together with sending information on the profession of Medical Technology to those requesting it, could also be considered among the time-consuming duties of the office. We have been somewhat embarrassed because ASMT has had to depend upon the Registry for nearly all the literature sent out (our only informational pamphlet is the one for pros-

pective members—we still have nothing at all for the would-be medical technologist). The Registry has questioned, and rightly so, whether or not it is wise for us to send out their material, due, primarily, to the possibility of duplication—and consequent waste—of such printed matter as they have composed.

The following motions were sent to the Board of Directors, with their resulting affirmative votes:

1. Handling of ASMT affiliate seal
2. Allowing rent for July and August in Houston Office
3. Having president visit Executive Office
4. Making President, President-Elect and immediate Past-President members of Board of Registry
5. Purchasing Ediphone equipment for Executive Office
6. Giving Executive Secretary permission to present cases without a Board motion
7. Special cases
8. Allowance of $1500.00 for Executive Office equipment
9. Allowance of $200.00 per month for Executive Office for remainder of fiscal year
10. Go on record as against compulsory health insurance
11. Special case relative to military service

We have gladly assisted and cooperated with all committees to the fullest extent possible, and are looking forward to the coming year when we shall be in a position to do so more efficiently. The purchase of an Ediphone Voicewriter and Transcriber resulted in prompt handling of a considerable volume of correspondence, copies of which reached the Chairman of the Board of Directors, as well as any committee chairman concerned. Much of the correspondence was concerned with the AMERICAN JOURNAL OF MEDICAL TECHNOLOGY.

THE AMERICAN JOURNAL OF MEDICAL TECHNOLOGY

This report will be combined with that of the Executive Office which is the business office of the JOURNAL as well. Since the office has been located in Houston, we have published five issues of the JOURNAL. We have gone over the subscriber, "Free," and "Exchange" lists. Subscribers have been billed regularly, and we are making an earnest effort to take the JOURNAL subscriptions out of the "step-child" class. We have contacted such potential new advertisers as have been called to our attention, and have succeeded in acquiring a few new accounts from among them, together with promises of consideration of advertising with us in the future. These will be followed through at a later date. We address the envelopes, sort, and tie them into bundles before sending them to the Gulf Publishing Company where the JOURNAL is mailed. With the latest (May) issue, the shipment consisted of 4839 copies. With the addition of new members between the date of mailing the JOURNAL and June 30, this number will be increased.

As is shown in the Executive Office and JOURNAL audits, both divisions are on a sound financial basis. The Board of Directors generously acceded to our requests for much-needed furnishings for the office. The expenditures of this year, however, will not have to be repeated annually. Such equipment as will be needed for the future growth of the ASMT will be considered carefully. We are looking to a future which will hold continued growth and development of an efficient administrative plant for our organization.

Rose Matthaei, MT (ASCP)
Executive Secretary, ASMT
Editor-in-Chief, AJMT

STATE SOCIETY OFFICERS
1950-51

ALABAMA: President: Louise Cason, 808 South 20th St., Birmingham.
Vice-president: Sarah Eidson, Jefferson Hospital, Birmingham.
Secretary: Mrs. Erin Harrell, Medical College of Alabama, Birmingham.
Treasurer: Mrs. Norma Dickson, 2657 Lane Park Road, Apt. D, Birmingham.

ARKANSAS: President: Betty Rice, P. O. Box 2731, Little Rock.
President-elect: Mrs. Bennie R. Bargas, 3923 Oakwood, Little Rock.
Secretary: Virginia Vaught, Army-Navy Hospital, Hot Springs.
Treasurer: Henry C. Dyer, 211 Sunset Ave., Nashville.

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President-elect: Adabelle Noyes, 330 Willow Ave., Coste Madera.
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Secretary: Ruth Hagaman, Minturn.
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Secretary: Isabelle McCann, Backus Hospital, Norwich.
Treasurer: Irene Salamandra, 236 W. Broad St., Stamford.
Executive Committee: Bertha Diem, St. Francis Hospital, Hartford.

DELAWARE: List of 1950-51 Officers not available in Executive Office.

DISTRICT OF COLUMBIA: List of 1950-51 Officers not available in Executive Office.

FLORIDA: President: Lois Hensley, care of Nurses' Home, Morrell Memorial Hospital, Lakeland.
Vice President: Marie Colburn, 327 N. E. 18th St., Miami.
Secretary: Mrs. Loretta D. Beal, 491 30th St., St. Petersburg.
Treasurer: Doris Dede, 911 Citizens' Bldg., Tampa.

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Vice President: Alice Blair, Emory University Hospital Lab., Emory University.
Secretary: Evelyn Garrison, 1245 Ridgewood Drive, N. E., Atlanta.
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INDIANA: President: Nila Maze, 23 West 16th St., No. 37, Indianapolis.
Vice President: Dorothy Prestrud, 215 Pine Lake, LaPorte.
Secretary: Ethel Elizabeth Fox, 1924 North Delaware, Indianapolis.
Treasurer: Helen Kottlowski, 1230 Villa Ave., Indianapolis.

IOWA: List of 1950-51 Officers not available in Executive Office.

KANSAS: President: Mrs. Eileen Keller, 518 South Madison, Wichita.
President-elect: Ruby Downum, 408 South Water, Wichita.
Secretary: Marjorie Stroup, 1914 Olathe Blvd., Kansas City.
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2nd Vice President (Membership): Ruth Cundiff, Box 502, Allen.
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President-elect: Ruth Cleo Ball, 3000 Polk Ave., Ogden.
Secretary: Katherine Dean, 3000 Polk Ave., Ogden.
Treasurer: Edith King, 437 8th Ave., Salt Lake City.
Board of Directors: Mary Lettieri, 1047 Yale Ave., Salt Lake City; Julie Well, 1267 Alameda St., Salt Lake City; Adrie E. Langhan, 3000 Polk Ave., Ogden.

VERMONT: List of 1950-51 officers is not available in Executive office.

VIRGINIA: President: Eleanor Rawles, 800 Wainwright Bldg., Norfolk.
President-elect: Frances Crouch, 1405 Hillcrest Ave., Roanoke 12.
Secretary: Claire Hulcher, 4004 Hermitage Rd., Richmond.
Treasurer: Joy Austin, 10 Oakhurst Circle, Charlottesville.
Corresponding Secretary: Margaret Bryan, 2227 Monument Ave., Richmond.

WASHINGTON: No list of 1950-51 officers available in Executive Office.

WEST VIRGINIA: President: Constance Peterkin, 1110 Ann St., Parkersburg.
Vice President: Dorthy Crawford, Rt. No. 1, Box 33, St. Albans.
Secretaary: Mrs. Ruth Lay, 1202 - 6th Ave., Huntington.
Treasurer: Mr. Gordon Starkey, The Myers Clinic, Philippi.
Board of Directors: Thelma Wilson, 329 Rogers St., Bluefield.

WISCONSIN: President: Betty Joseph, 949 N. 23rd St., Milwaukee.
President-elect: Elaine Beck, 3321 N. Maryland, Milwaukee 11.
Secretary: Sister Martin M. Fruchtl, St. Mary's Hospital, Madison.
Treasurer: Delphine B. Goyette, St. Francis Hospital, LaCrosse.
Board of Directors: Grace Ballard, 925 N. 13th St., Milwaukee; Sister M. Gertrude Conwell, St. Francis Hospital, LaCrosse; Ruth Mentges, 510½ Third St. Wausau; Dorothy Zoeller, 711 N. 16th St., Milwaukee; Merian B. Smith, 228 E. Sunset St., Madison.

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Please send in dates of annual conventions as soon as they are decided upon, so that we may print them PRIOR to meetings. Highlights of programs will also be printed in advance of meetings if we receive the information. In this way newcomers to your state or persons in adjoining states may be encouraged to attend your annual sessions.

CONVENTION DATES: American Society of Medical Technologists: Swampscott, Massachusetts, New Ocean Hotel Headquarters: June, 1951. Mrs. Elinor Judd, 452 Park Drive, Boston, Mass., Convention Chairman.

Head Technologist: $3600 maintenance. 100-bed New York hospital, staff of four technicians. Unusually attractive location; new laboratory under construction. (T1140)

Medical Technologist: For well-established clinic having staff of thirty specialists; well-equipped laboratory. Excellent location middlewest university town. 5½ day week. (T1124)

Medical Technologist: Excellent opportunity with small approved hospital pleasantly located, middlewest college town. Opportunity to learn x-ray. Good salary; living quarters available. (T 1054)

Medical Technologist: Small approved hospital, well-equipped laboratory. Attractive Maine resort community of ten thousand. 5½ day week; light schedule. $2400 maintenance. (T811)

Medical Technologist: Four-man clinic, modern equipment, newly constructed clinic; well-established practice; prosperous community 50,000 Great Lakes region. (T946)

Medical Technologist: Registered, degree, experienced; able to teach. 200-bed hospital with approved school for technologists. Eastern state capital and university town. (T1153)

Medical Technologist: For 250-bed approved hospital, western university town. Five technicians in department; duties varied, including blood bank work. $3000 yearly. (T1150)

Biochemist: Female, Master's degree. Capable, experienced person, take charge Biochemistry Section 300-bed general hospital midwest state capital. Unusually attractive salary .(T1164)

Assistant Laboratory Technician: Opportunity serve internship under registered technologist. $2200 maintenance. Eight hour day; paid annual vacation. 100-bed approved Illinois hospital. (1108)

Blood Bank Technologist: Full responsibility department. 100-bed approved hospital exclusive Chicago suburb. $225 plus meals and laundry. 44 hour week. (T1050)

Chief Technologist: Experienced, registered male technologist able to take complete charge laboratory active, well-established clinic midwest college town. $4800 yearly. (T1133)

Chief Technologist: 200-bed approved hospital pleasant college town adjacent California state capital. Five-day week. Registration, experience required. (T1021)

Chief Technologist: Female, registered; master's degree. Supervise clinical pathology, organize schedules, order supplies; 300-bed hospital midwest town 300,000. Excellent salary. (T1165)

Head Technologist: Registered. Five years' experience. Busy laboratory 200-bed approved hospital, pleasant residential community, adjacent New York. Minimum salary $3000 salary. (T1154)

(We have many other excellent opportunities—please write for complete list—strictly confidential)

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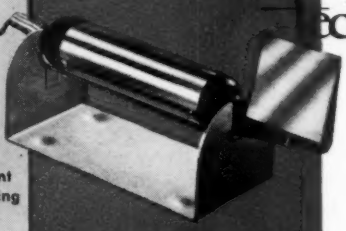
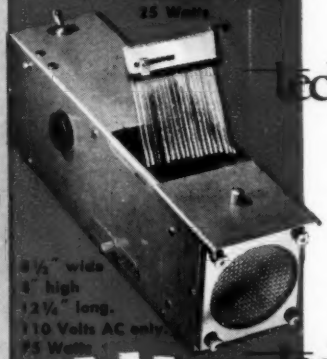


technicon paraffin knife

makes work with paraffin-embedded tissues quick and easy. Great for cutting large blocks into small ones; for mounting blocks on a microtome object disc; for squaring up blocks; for separating ribbons in a water bath . . . Hollow stainless steel handle doesn't heat up; spring switch under thumb gives Finger-Tip Heat Control — easy to keep knife at the right temperature. When not in use lay knife in saddle rest — **Blade UP** keeps knife hot; **Blade DOWN** current is "off."



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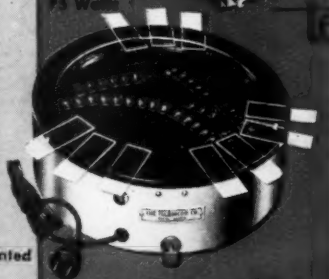

technicon *constant temperature* water bath

insures smooth, even spreading of your tissue ribbons. The water temperature is just right — never too hot or too cold, thermostatically held at any set temperature from 20° to 60°C. There's no melting paraffin to distort tissues — no folds or wrinkles, no bubbles due to frequent water change. Temperature stays constant, day-in, day-out. And it's easy to see your sections against the dull finished black interior of the bath.

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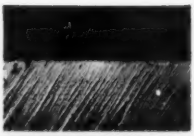
Supplied with levigated alumina, instruction manual, Carborundum wheel dresser and safety shields. **$240.00**



Photomicrograph right (200x) shows edge of microtome knife carefully stropped and honed by hand.

Lower illustration, same magnification, shows edge produced on Berkeley Microtome Knife Sharpener, in *one-third of the time.*

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